3400

CONTENTS OF VOL. XX.

[NINTH SERIES.]

NUMBER 115.

Page

I. Notes from the Gatty Marine Laboratory, St. Andrews.—No. L. By Prof. M'Intosh, M.D., LL.D., D.Sc., F.R.S., &c. (Plate I.) 1

II. The Species of the Genus *Stenomicra*, Coquillet (Diptera, Acalyptrata). By J. R. Malloch. (Plate II.) 23

III. *Acipenser persicus*, a Sturgeon from the Caspian Sea. By N. Borodin. (Plate III.) 26

IV. On the Cynodont Reptile *Tribolodon frerensis*, Seeley. By George Gaylord Simpson 28

V. New or little-known *Tipulidæ* (Diptera).—XXXV. Australasian Species. By Charles P. Alexander, Ph.D., F.E.S., Massachusetts Agricultural College, Amherst, Massachusetts, U.S.A. 33

VI. The Systematic Position of some Genera of Copepoda-Harpacticoida endemic in Southern Russia. By E. W. Borutzky (Moscow) 54

VII. On the Occurrence of the Amphipod *Synurella ambulans* in Russia. By E. W. Borutzky 63

VIII. Diagnoses of new Genera and Species of South African Marine Fishes. By K. H. Barnard, D.Sc., F.L.S. 66

IX. A new Subspecies of *Bassaricyon* from Colombia. By Oldfield Thomas 80

X. Parallel Evolution in some Opisthoglyphous Snakes, with the Description of a new Species. By H. W. Parker, B.A. 81

XI. On some Fulgorids from the South Pacific. By F. Muir (Hawaiian Sugar Planters' Experiment Station, Honolulu, T.H.) .. 86

XII. On the Mating Habits of some Spiders of the Family *Theridiidæ*. By G. H. Locket, B.A. 91

XIII. New Himalo-Chinese Butterflies. By H. T. G. Watkins. 99

XIV. A further Note on *Nematospiroides dubius*, Baylis, 1926. By H. A. Baylis, M.A., D.Sc. 102

XV. Two new *Hispinæ* (Col.) from Fiji and New Britain. By S. Maulik 105

XVI. The Occurrence of *Koelreuteria* (Sapindaceæ) in Tertiary Rocks. By W. N. Edwards 109

Page

XVII. Additions to the Marine Fauna of St. Andrews since 1874. By Prof. M'Intosh, M.D., LL.D., D.Sc., F.R.S., &c., Gatty Marine Laboratory, St. Andrews 113

XVIII. Rhizopoda and Heliozoa from British Columbia. By G. H. Wailes 153

XIX. The "Scrub Itch-Mite" of North Queensland: a new Species of *Trombicula*. By Louis W. Sambon, M.D., Lecturer in the London School of Hygiene and Tropical Medicine 157

XX. The Heteromera and some other Families of Coleoptera from Polynesia collected on the 'St. George' Expedition, 1925. By K. G. Blair, B.Sc., F.E.S. 161

XXI. *Dyspterna woodi*, gen. et sp. n., a Carnivore from the Oligocene, Isle of Wight. By A. Tindell Hopwood, M.Sc., F.L.S. .. 171

NUMBER 116.

XXII. A new Species of *Capitosaurus* from the Trias of the Black Forest. By W. E. Swinton. (Plate IV.) 177

XXIII. Two new Species and a new Genus of Cretaceous Pycnodonts from the South of England. By Errol Ivor White, of the British Museum (Nat. Hist.) 186

XXIV. Some new Caucasian Orthoptera. By B. P. Uvarov .. 192

XXV. On further Patagonian Mammals from Neuquen and the Rio Colorado collected by Señor E. Budin. By Oldfield Thomas. 199

XXVI. Notes on the Two Genera *Nusa* and *Pogonosoma* (*Laphrinæ*). By Gertrude Ricardo 205

XXVII. Description of Two Subspecies of Leopards. By R. I. Pocock, F.R.S. 213

XXVIII. Some new Parasitic Nematodes from Australia. By H. A. Baylis, M.A., D.Sc. 214

XXIX. New Indian *Tipulidæ* (Diptera). By F. W. Edwards.. 225

XXX. Crane-flies collected by Dr. P. A. Buxton in the New Hebrides. By F. W. Edwards 230

XXXI. Diptera Nematocera from the South Pacific collected by the 'St. George' Expedition, 1925. By F. W. Edwards 236

New Books:—Handbook of the Echinoderms of the British Isles. By Th. Mortensen 244

The Fauna of British India.—Hirudinea. By W. A. Harding, M.A., F.L.S., and Prof. J. Percy Moore. With an Historical Preface by Sir A. E. Shipley, G.B.E., F.R.S. 245

A Bird Book for the Pocket. By Edmund Sanders 247

The Platypus, its Discovery, Zoological Position, Form and Characteristics, Habits, Life-history, etc. By Harry Burrell, C.M.Z.S. 248

NUMBER 117.

Page

XXXII. Notes on the Cephalopoda.—III. On the Anatomy and Classification of the North Atlantic Species of *Bathypolypus* and *Benthoctopus*. By G. C. Robson, M.A. 249

XXXIII. Papers on Oriental *Carabidæ*.—XX. By H. E. Andrewes 263

XXXIV. A Collection of Echinoderms from China. By George A. Smith, British Museum (Natural History) 272

XXXV. Genera of *Membracidæ* (Hemiptera) transferred to other Families. By W. E. China 279

XXXVI. Preliminary Remarks on Melichar's "Monographie der Cicadellinen" (Hemipt. Jassoidea). By W. E. China 281

XXXVII. A new Species of *Notonecta* from North Africa, with a Note on the Synonymy. By Teiso Esaki 284

XXXVIII. On further Monkeys of the *Callicebus torquatus* Group. By Oldfield Thomas 287

XXXIX. On Bornean Specimens of the Teledu (*Mydaus*). By Oldfield Thomas 288

XL. A Revision of the Genera and Species contained in Lendenfeld's 'Die Chalineen des australischen Gebietes.' By Maurice Burton, M.Sc. 289

XLI. A new Species of *Sparnia*, Stål, from South Chile (*Delphacidæ*, Homoptera). By F. Muir, Hawaiian Sugar Planters' Experiment Station, Honolulu, T.H. 296

XLII. A Comparative Study of the Otoliths of the Neopterygian Fishes (*continued*). By G. Allan Frost, F.L.S., F.G.S., F.Z.S. (Plate V.) 298

XLIII. On the Silurian Coral *Tryplasma rugosum* (Edwards and Haime). By Stanley Smith, M.A., D.Sc., F.G.S., and W. D. Lang, M.A., Sc.D., F.G.S. (Plate VI.) 305

XLIV. *Ptilophyllum* and *Rhysodes*, gen. nov. By Stanley Smith, M.A., D.Sc., and Reginald Tremberth, B.Sc. (Plate VII.)... 309

XLV. Notes on a small Collection of Mysidacea from West Africa. By W. M. Tattersall, D.Sc., University College, Cardiff 313

New Book:—A Handbook of the Birds of Eastern China. By J. D. D. La Touche, C.M.Z.S., C.F.A.O.U., M.B.O.U., etc. Part IV. 317

Proceedings of the Geological Society 318, 319

NUMBER 118.

XLVI. Descriptions of new Species of Heterocera from Africa and the East. By G. T. Bethune-Baker, F.L.S., F.Z.S. 321

XLVII. The Chordotonal Organs of the Antenno-maxillary Complex in the Larvæ of Cyclorrhaphous Diptera. By D. Keilin, Sc.D. (Plate VIII.) 334

Page

XLVIII. On the Structure and Development of *Stauria favosa* (Linnæus). By STANLEY SMITH, M.A., D.Sc., F.G.S., and T. A. RYDER, Ph.D., B.Sc., F.G.S. (Plate IX.) 337

XLIX. New and little-known Species of Neuroptera in British Collections.—Part III. By P. ESBEN-PETERSEN, Silkeborg. (Plates X. & XI.) 343

L. Two new *Syrphidæ* from Uganda (Diptera). By C. H. CURRAN, Ottawa, Canada 350

LI. New or little-known *Tipulidæ* (Diptera).—XXXVI. Australasian Species. By CHARLES P. ALEXANDER, Ph.D., F.E.S., Massachusetts Agricultural College, Amherst, Massachusetts, U.S.A. 353

LII. Descriptions of Three new Species of Gall-Mites (*Eriophyidæ*) from Sudan. By A. M. MASSEE, F.E.S., East Malling Research Station 372

LIII. A Contribution to the Knowledge of the Species of Gall-Mites (*Eriophyidæ*) of Sussex. By A. M. MASSEE, F.E.S., East Malling Research Station 375

LIV. Turbellaria from Lake Tanganyika. By H. A. BAYLIS, M.A., D.Sc. 380

LV. Exotic *Muscaridæ* (Diptera).—XX. By J. R. MALLOCH, Bureau of Biological Survey, Washington, D.C. 385

LVI. On the Classification of the Tertiary Nautili. By L. F. SPATH, D.Sc., F.G.S. 424

LVII. Hymenoptera and a Caddis Larva from the Miocene of Colorado. By T. D. A. COCKERELL, University of Colorado 429

LVIII. Systematic and Geographical Notes on Aquatic Heteroptera of the Ethiopian Region. By Dr. TADEUSZ JACZEWSKI, Polish Museum of Natural History, Warsaw, Poland 435

LIX. New Species of *Halticidæ* from Trinidad and Porto Rico. By G. E. BRYANT, Entomological Assistant, Imperial Bureau of Entomology 446

LX. A Revision of the Frogs of the Genera *Pseudopaludicola*, *Physalæmus*, and *Pleurodema*. By H. W. PARKER, B.A. 450

LXI. The Cæcilian Genera *Uræotyphlus* and *Geotrypetes*. By H. W. PARKER, B.A. 478

LXII. *Podisma kingdoni*, sp. n. (Orthoptera, *Acrididæ*): a Contribution to the Zoogeography of the Himalayas. By B. P. UVAROV. 481

New Books:—C. TATE REGAN. The Pediculate Fishes of the Suborder Ceratioidea. The Danish 'Dana' Expeditions, 1920–22, in the North Atlantic and the Gulf of Panama. Oceanographical Reports.—No. 2 485

An Introduction to Experimental Biology. By G. R. DE BEER .. *ib.*

Proceedings of the Geological Society 486, 487

NUMBER 119.

Page

LXIII. On some new and little-known Orthoptera from Palæarctic Asia. By S. P. TARBINSKY 489

LXIV. A Revision of the Genera and Species contained in Lendenfeld's 'Die Chalineen des australischen Gebietes.'—II. By MAURICE BURTON, M.Sc. 502

LXV. On a small Collection of Reptiles from Morocco. By Baron G. J. DE FEJÉRVÁRY, Ph.D., F.Z.S. France, H.M. Malta H.S.S., Reader in the R. Hung. Elizabeth University (Pécs), Curator, in charge of the Herpet. Coll., Hung. Nat. Museum (Budapest) 512

LXVI. On a Fossil Cyprinodont from Ecuador. By ERROL IVOR WHITE, Ph.D., F.G.S. 519

LXVII. Revision du Genre *Heteromycteris*, Kaup [Pisces Heterosomata Soleiformes]. Par PAUL CHABANAUD 523

LXVIII. Sur *Achiropsis nattereri*, Stdr., et *Apionichthys dumerili*, Kaup [Pisces Heterosomata, Soleiformes]. Par PAUL CHABANAUD. 528

LXIX. Bees from the Malay Peninsula. By T. D. A. COCKERELL. 530

LXX. "Synonymic Notes on *Jassoidea* and *Membracidæ*." By F. W. GODING 541

LXXI. *Neusticurus dejongi*, sp. n., a new Lizard from Surinam. By L. D. BRONGERSMA, Zoological Laboratory, University, Amsterdam. 543

LXXII. Notes on Fossorial Hymenoptera.—XLII. By ROWLAND E. TURNER, F.Z.S., F.E.S. 545

LXXIII. New Parasitic Hymenoptera in the British Museum. By ROWLAND E. TURNER, F.Z.S., F.E.S. 553

Proceedings of the Geological Society 560

NUMBER 120.

LXXIV. Contributions towards a Knowledge of the European Thysanoptera.—III. By RICHARD S. BAGNALL, F.R.S.E., F.L.S. 561

LXXV. Fossil Insects in the British Museum. By T. D. A. COCKERELL, University of Colorado 585

LXXVI. The Godman-Thomas Expedition to Peru.—VI. On Mammals from the Upper Huallaga and neighbouring Highlands. By OLFIELD THOMAS 594

LXXVII. An Abnormal Specimen of *Rana temporaria* (♂). By C. R. WHITE-THOMSON, B.A., F.Z.S. 609

LXXVIII. A new Species of Trematode from *Mabuia dissimilis*. By G. D. BHALERAO, M.Sc., Professor of Zoology, Hislop College, Nagpur, C.P., India 611

LXXIX. On the Families and Genera of the Class Echiuroidea. By C. C. A. MONRO 615

LXXX. A Redescription of the Species *Oxysomatium macintoshii* (Stewart, 1914) (Nematoda). By J. N. KARVE, B.Sc., Zoology Department, Hislop College, Nagpur, C.P., India 620

Index 629

PLATES IN VOL. XX.

PLATE I. Figs. 1, 2. South African Sagitta. Figs. 3–8. Caudal parasite of S. bipunctata. Figs. 9–10. Parasitic mass in Hermadion.
II. Two new species of Stenomicra (Dipt.).
III. Acipenser persicus, sp. n.
IV. Capitosaurus semiclausus, sp. n.
V. Otoliths of the Div. Perciformes.
VI. Tryplasma rugosum (Edwards & Haime) and Eridophyllum seriale, Edwards & Haime.
VII. Ptilophyllum lindstromi, sp. n., and Rhysodes samsugnensis, sp. n.
VIII. Chordotonal organs of Cyclorrhaphous Diptera.
IX. Stauria favosa (Linnæus).
X. Fig. 1. Allocormodes woodi, sp. n., ♀. Figs. 2 & 3. Encyopsis lloydi, sp. n., ♂. Fig. 4. Ameropterus delicatulus, McLachl., ♂.
XI. Fig. 5. Myrmeleon nigrinus, sp. n. Fig. 6. Glenurus withycombei, sp. n. Fig. 7. Elachyleon punctipennis, gen. et sp. n. Fig. 8. Spilosmylus ceyloniensis, sp. n.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[NINTH SERIES.]

> "................. per litora spargite muscum,
> Naiades, et circùm vitreos considite fontes:
> Pollice virgineo teneros hìc carpite flores:
> Floribus et pictum, divæ, replete canistrum.
> At vos, o Nymphæ Craterides, ite sub undas
> Ite, recurvato variata corallia trunco
> Vellite muscosis e rupibus, et mihi conchas
> Ferte, Deæ pelagi, et pingui conchylia succo."
>
> *N. Parthenii Giannettasi*, Ecl. 1.

No. 115. JULY 1927.

I.—*Notes from the Gatty Marine Laboratory, St. Andrews.*— No. L. By Prof. M'Intosh, M.D., LL.D., D.Sc., F.R.S., &c.

[Plate I.]

1. Additional Remarks on the Pelagic Fauna of St. Andrews Bay during the Months of the Year.
2. Further Remarks on the Occurrence of *Sagitta bipunctata*, Quoy & Gaimard.
3. On a Parasitic Growth on the Tail of *Sagitta* and in a Cirrus of *Hermadion* from the 'Challenger.'
4. On a South African *Sagitta* and the Proportional Size of the Central Nervous System.

1. *Additional Remarks on the Pelagic Fauna of St. Andrews Bay during the Months of the Year.*

For many years the pelagic fauna of the Bay of St. Andrews has received attention—more especially in connection with the nourishment of the food-fishes, and it may therefore, near the close of a career, be finally summarised and contrasted with other areas of the British seas which have received like attention. The basis of this summary is the account given by the author in the Seventh Annual Report of the Fishery Board for Scotland in July 1889, part iii. pp. 259-310. It has not been thought necessary to repeat the various species mentioned in that paper—except where new facts or sizes are concerned,—and therefore the present is supplementary to that account. *Tomopteris* has already been dealt with, and *Sagitta* will be specially taken in hand. Much yet remains to be done in this department at St. Andrews *.

On January 9th, 1891, Pleurobrachiæ, ½ inch in length, and *Lesueuria*, 2 in. long, were in the bottom-net, with *Beroë*, 1½ in. long, and on the 14th, 1892, there were many minute young of the foregoing along with a few adults—showing that the swarms were often mixed. On the 18th *Harmothoë imbricata* presented ova both on the dorsum and on the feet, whilst a male on the 31st shed many ripe sperms.

In this month Prof. Garstang at Plymouth considered the contents of the tow-nets a trifle richer than in December, the Alga (*Halosphæra*) is usually present, but there is a marked scarcity of Cœlenterate life. He notes Cirripede *nauplii*, Polychæt trochophores (*Phyllodoce* &c.), Copepods, a few large Sagittæ, besides *Zoeæ* and Veligers. There is thus a marked contrast with St. Andrews as regards the Cœlenterates. Teleostean eggs and larvæ make their appearance at the end of the month, and therefore somewhat earlier than in the north. Dr. Lebour mentions *Corycæus*, *Oithona*, and *Pseudocalanus* in January. In the Irish Sea Prof. Johnstone found Diatoms, Peridinians, and Copepods scarce, and thus the condition differs from St. Andrews—where Copepods abound, along with a few young Schizopods. Mr. Flattely † does not specify the pelagic annelids of January, though he mentions that Leschke at Kiel gives the larvæ of *Spio* and *Polydora* from January to March. In the Clyde *Phialidium* chiefly represented the Medusæ. Polychæt larvæ, *Cyphonautes*, *Fritillaria*, and Copepods were common. The presence of *Fritillaria* is diagnostic as compared with St. Andrews.

On the 6th February minute bodies like developing Echinoderms, smaller than the larvæ of *Cribrella*, appeared in the bottom-nets (1891). On the 17th pinkish forms resembling early Holothurian larvæ, moving slowly by aid of cilia, occurred in the same nets. On that date *Polygordius* larvæ with a dark pigment-band were met with. *Nerine* larvæ were numerous on the 16th, and those with hexagonal reticulation of the capsule swarmed in the bottom-net, some resting, others ciliated and in motion. Older types with long bristles were also present, and in a calm day reached the surface. Swarms of young *Diastyli* on the 23rd (1893) appeared in the bottom-net.

---

* I am indebted to Prof Garstang's, Dr. Lebour's, and Mr. Bles's accounts in the Jour. M. B. A., to Prof. Meek's Reports of the Dove Marine Laboratory, to Prof. Johnstone's, Mr. Andrew Scott's, and Mr. Chadwick's observations in the Irish Sea, as well as to Sir William Herdman's work in the same waters, to Mr. E. T. Browne's and Miss S. Marshall's survey of the Clyde Plankton, for the means of comparison with the Pelagic Fauna of St. Andrews Bay.

† Dove Marine Lab. Rep. 1923, p. 98 &c.

Cyphonautes and young stages of *Oikopleura* occurred in the bottom-net on the 23rd.

On this date a few Radiolarians appeared in the bottom-net, along with minute nautiloid shells of Foraminifera. On the same date, *Tima bairdi*, three inches in diameter, was found in the bottom-net with ova developing; whilst on the 14th a few examples of *Beroë* and *Lesueuria* reached the surface in a dead calm.

In calm weather swarms of *Parathemisto* frequent the surface of the water, along which they dart with amazing rapidity. In a day or two, again, they occurred in the bottom-net only.

On the 24th the S.F.B. Ship 'Garland' procured the young of the wolf-fish 21 mm. in length (this season's young), young *Agonus* 47 mm., Schizopods, and two specimens of *Clione*. The silvery-bluish eyes and abdomen of the young wolf-fishes are only seen after death, for in life these parts are iridescent greenish.

At Plymouth Prof. Garstang found the sea swarming with Copepod and Cirripede *Nauplii*, with larval Polynoidæ, Phyllodocidæ, Prosobranch and Opisthobranch veligers, with *Mysis* and *Zoeæ* stages of Decapod larvæ. Cœlenterates appear in the form of ephyræ of *Aurelia*, *Rathkea octopunctata* (Anthomedusæ), *Phialidium variabile*, Hæckel (Leptomedusæ), medusoids of *Obelia*, larvæ of Ctenophores, and errant specimens of *Diphyes*. *Cyphonautes*, the post-larval stage of *Arenicola*, *Oikopleura dioica*, and *Auricularia* likewise are present. Dr. Lebour mentions Nauplii of *Balanus*, Nauplii of *Temora*, and others, *Pseudocalanus*, *Acartia*, and *Calanus*.

The pelagic fauna of Plymouth thus diverges in the less conspicuous numbers of the Ctenophores, in the earlier appearance of the Anthomedusæ and Leptomedusæ, as well as that of the larval Crustaceans. Moreover, the presence of *Diphyes* in the south is diagnostic.

Off the coast near Cullercoats it is thought the annelid *Pœcilochætus* probably ripens in February and spring (*Mr. Flattely*). Only the young forms have been procured there and at St. Andrews.

The waters of the Clyde chiefly differed in the presence of *Fritillaria* and in the scarcity of *Tomopteris*, *Sagitta*, and *Parathemisto*.

During a storm on March 5th, 1891, the tow-nets, which could not be used from the boat, were plunged into the sea off the ledges of rock, and for a fortnight it was found that Nauplii abounded. Peculiar gelatinous ova (probably of *Sagitta*), and to which grains of sand adhered, were also obtained.

On the 8th a young *Ommastrephes* an inch long was captured in the bottom-net, which also held swarms of the eggs and larvæ of the *Nerine* formerly alluded to. On the 25th calm weather caused larval herrings, Copepods, and Sagittæ to frequent the surface. Numerous ova and fishes are entered in 1889.

At Plymouth *Halosphæra*, *Rhizosolenia*, and *Chætoceros* are often abundant along with *Tetraspora*, Pouchet, at the end of the month. The ephyræ of *Aurelia* are numerous and increasing in size. *Sarsia prolifera* and *Podocoryne* are added to the Anthomedusæ, whilst the Leptomedusæ are increased by *Clytia*, *Irene*, and *Thaumantias*. *Arachnactis* (Cerianthid), minute Planarians, Annelid larvæ (Polydora) increase the captures of February. Amongst Crustacea *Podon* and *Evadne*, numerous larvæ, the *Zoeæ* of *Porcellana*, *Auricularia*, *Bipinnaria*, and Plutei occur occasionally, and swarms of *Oikopleura* (Prof. Garstang). Dr. Lebour enters *Pseudocalanus* and Nauplii of *Balanus*.

In the Irish Sea *Zoeæ* were common between February and June, whilst the *Megalops*-stage was frequent in May. The Nauplius-larva of *Balanus*, Echinoderm Plutei, and Polychæt larvæ seem to attain their maximum in the pelagic fauna in March, and the *Cypris*-larvæ in April (*Prof. Johnstone*, &c.).

The estuary of the Clyde, again, still had *Fritillaria*.

Much that is common occurs in the various areas mentioned, for the ephyræ of *Aurelia* likewise appeared in the north, but the naked-eyed Medusæ were in advance in the south. The same may be said of the Zoeæ of *Porcellana*, of the larval Echinoderms, and of *Oikopleura*.

During April the peculiar gelatinous masses described in the Report of the Fishery Board and in the 'Annals and Magazine of Natural History' appeared in the Bay, and also in May and June *.

At the beginning of the month (1891) *Hybocodon* was captured, though it was more frequent somewhat later in the year. It bears two tentacles studded beyond the bulbous region with thread-cells like those of *S. rubra*, and with an enlarged base having carmine pigment (four reddish carmine ocelli). A bud of considerable size is attached—also with two tentacles. The manubrium is large and trumpet-shaped distally. A bud of considerable size arose from the region of the pigment-spot—apparently between the two tentacles. A Copepod was in the cellulo-granular manubrium, which was slightly tinted. Larval annelids and pelagic forms of *Autolytus* abounded. Vast numbers of *Nauplii* appeared at the surface of the water (1891); only a few specimens of *Oikopleura* were in the bottom-net.

The nets at Plymouth were choked with *Tetraspora*, and this towards the end of the month is converted into gelatinous balls of motile spores. *Rhizosolenia* and *Coscinodiscus* take the place of *Halosphæra*. *Bougainvillea* supplants *Rathkea*. There is a reduction apparently of the larvæ of *Polychæta* and *Nauplii*, but the *Megalops*-stage has increased in numbers. Plutei are plentiful (*Prof. Garstang*).

Dr. Lebour enters *Pseudocalanus*, *Nauplii* of *Temora*, and *Acartia* as common. Towards the end of the month *Podon* and *Phæocystis* appeared.

Whilst in the south a reduction in larval annelids took place, such was not observed in the north, where the pelagic *Autolyti* with their eggs were frequent. *Tomopteris* also appeared to be more conspicuous in the north. The *Megalops*-stage of Crustacea was more characteristic of the south. Off Cullercoats April seems to be the month when the pelagic stages of *Autolytus* are common. The Clyde area was still distinguished by the presence of *Fritillaria* and *Oikopleura*, which appeared in large numbers.

---

* Seventh Ann. Rep. pp. 268–271, 1889.

Besides the somewhat long record of May in 1888 an important addition of a Siphonophore (viz., *Halistemma* *) at St. Andrews was made in 1890, and it is interesting that an allied form was procured by the authors of the 'Marine Plankton' † in the Irish Sea.

The sea swarms at Plymouth with Craspedote Medusæ—e g., *Obelia*, *Phialidium*, and *Thaumantias*. The most abundant Anthomedusa is *Corymorpha*. Full-grown Ctenophores are numerous, and the lobate form of *Bolina hydatina*. The larvæ of *Halcampa* are plentiful on Campanularian Medusæ. The *Zoeæ* of *Porcellana* and the Portunidæ are abundant. *Tetraspora* disappears toward the end of the month (*Prof. Garstang*). The same forms as in April are entered by Dr. Lebour, with *Calanus* in addition.

The maximal forms in May in the Irish Sea are the Diatoms *Chætoceras debile*, *C. sociale*, *Rhizosolenia semispina*, and *R. setigera*, *Lauderia boreale*, *Thalassiosira gravida*, and *T. nordenskioldi*; various species of *Peridinium*; the *Cypris*-stage of *Balanus*, the *Megalops*-stage of crabs, and the Copepod *Anomalocera patersoni* (Prof. Johnstone) ‡. It is curious that at St. Andrews the latter species hitherto has been found only at the outer margin of the Bay.

Fritillaria declined in numbers at the end of the month, whilst *Oikopleura* increased in the Clyde. Mr. E. T. Browne § notes that *Hybocodon* was plentiful in May, but he was in doubt as to its hydroid. At St. Andrews we have been accustomed to connect it with *Corymorpha*, but actual proof is wanting.

In the south the medusoid of *Corymorpha* appears to be more plentiful, with full-grown Ctenophores. Moreover, the larvæ of *Halcampa* takes the place of the northern *Peachia* on the discs of Medusæ. The pelagic fauna in the Irish Sea agrees with that at St. Andrews, though perhaps in some cases the forms are earlier.

In addition to the remarks on the algæ in 1889 (S. F. B. Report), it may be mentioned that though in June *Rhizosolenia* was noted as in vast abundance yet young gadoids measuring from ½ in. to 1⅞ in. occurred in the midst of it, apparently unaffected by their surroundings, which were so distasteful to the fishermen. *Bougainvillea nigritella*, again, showed a reddish hue on some of the black points. The eggs and larvæ of *Pleurobrachia* were also common.

---

* *Vide* Dr. A. D. Sloan, Ann. & Mag. Nat. Hist., April 1891, p. 413, pl. xii.

† 'Marine Plankton,' Johnstone, Scott, and Chadwick, 1824, p. 24, pl. vi. fig. 6.

‡ 'Marine Plankton,' p. 58 &c.

§ Proc. R. S. Edin. Inst. xxv. p. 750.

The great abundance of forms like young *Peachia* in the large mid-water net opposite the River Eden (where the net had touched the sand) was a feature of the 15th June, 1887. Many of the anemones cling to specimens of *Thaumantias*, the short tentacles being applied to the disc, whilst the mouth was widely open. The sizes of the anemones varied from $\frac{1}{8}$ to $\frac{3}{16}$ of an inch. Such, therefore, differed from pelagic *Peachia*-like forms got earlier in the month (1st), which, instead of attaching themselves to the Medusæ around them, floated on the surface like *Arachnactis*, with their tentacles spread out, whilst others rolled on the bottom.

A minute unarmed Nemertean occasionally occurred at the beginning of the month, whilst amongst the pelagic annelids (June 24th) young Polynoids were very abundant at the surface, and most had scales, but a few were still pear-shaped. *Pholoè minuta*, again, was shedding sperms and ova. Young *Magelonæ* were in considerable numbers. On the 7th a *Nerine*-like form of a greenish hue, with a somewhat conical snout, and a double tentacular frill on each side in front was procured. Two small processes stood out beneath the snout. The branchiæ were richly ciliated and the bristles comparatively short. The young of *Phyllodoce* was occasionally met with along with young *Scoloplos*. In the Irish Sea the maximum appearance of Polychæt larvæ occurs between February and April (*Prof. Johnstone*).

Aurelia aurita and the Ctenophores reach their maximum at Plymouth. Leptomedusæ (large *Obelia* and *Thaumantias pilosella*) are plentiful. Terebellid larvæ appear in their tubes, along with the larva of the Gastropod *Echinospira* and the *Nauplii* of *Sacculina*. Minute *Oikopleuræ* are common, and sometimes hordes of *Salpa democratica mucronata* invade the harbour (*Prof. Garstang*).

Hormiphora plumosa, the Ctenophore common at Plymouth, was not seen in the adult condition after this date, but in the middle of September minute young and ova were found. *Obelia lucifera* was plentiful. *Porcellana*-zoeæ occurred on the 31st, and on the 28th *Appendicularia* (Mr. Bles). Dr. Lebour found the same Copepods on which the young fishes fed as in May, with the addition of Zoeæ of *Carcinus* and other Decapod larvæ.

Prof. Johnstone observes that from June to the beginning of August the Diatoms rapidly decrease, whilst the Peridinians swarm and the permanent zooplankton increases. His maximal forms in June are the diatoms *Rhizosolenia shrubsolei* and *Guinardia flaccida*, *Sagitta bipunctata*, and *Acartia clausa*. *Noctiluca*, again, appears frequently in the Irish Sea during most of the months of the year, but it has never been found at St. Andrews.

The maximum period for *Sagitta* is in June and July, whereas this could not be said for St. Andrews.

Corymorpha appeared in the Clyde this month, but other Medusæ were few. *Cyphonautes* was less common in May. *Fritillaria* had vanished.

Whilst *Aurelia* and the Ctenophores reach their maximum at Plymouth in June, they are later in the north, and the Ctenophores differ in regard to their maximum, though their abundance throughout most of the year at St. Andrews renders it difficult to decide. The appearance of Terebellid larvæ in their tubes occurs later in the north, where "*Salpa democratica mucronata*" has not been found either at St. Andrews or as a rule on the East Coast. As in the north *Rhizosolenia* is often in vast quantity in the Irish Sea in June. Off Peel the larval stages of *Ophiothrix fragilis* are very abundant—far more than they are at St. Andrews, a feature readily explained by the dense masses of the adults which come up in the dredge, whereas they are thinly distributed near low water at St. Andrews, the open area of the Bay being carpeted with *Asterias rubens*.

The Protozoan types during July are indicated in the 7th Report of the S. F. B. p. 281. The bottom-nets, indeed, often abounded with Diatoms and Infusoria, Rotifers, and the circular gelatinous bodies formerly described. The Cœlenterates are also detailed, and these not only were numerous in the Bay, but extended up the estuary of the Forth as far as Elie, and probably beyond it. On the 2nd (1889) the ova of Pleurobrachia were common with the embryo revolving in the capsule, the statoliths projecting freely at the end opposite the gaping circular mouth. The adults of good size occurred in both mid-water- and bottom-nets along with *Lesueuria*, *Beroë*—indeed, the Cœlenterates in general reached their climax this month. Ova of *Pleurobrachia* were certainly common, but it is difficult to fix a special month as the spawning-period of this form. The attachment of the young forms allied to *Peachia* takes place usually before July; but in some years they are not observed till the middle of the latter month. Occasionally enormous numbers of *Aurelia* and *Cyanea* occur at the surface of the Bay in July.

The bottom-nets are often crowded with larval Echinoderms at various stages, and as the month advances they make noteworthy progress in development (Auricularian, Bipinnarian, and Brachiolarian stages).

The surface-nets, again, caught many young examples of *Magelona* with the papillæ on the tentacles, whilst the snout was akin to that of a *Spio*, with an eye at the base of each tentacle besides a median one. A larva resembling Claparède's (*Pœcilochætus*) was also procured. The young of *Harmothoë* with eight segments and ciliated palps were likewise met with, bearing four pairs of scales with papillæ, four eyes, and having a length of

$\frac{1}{35}$ of an inch. The intestine was yellowish with pale oil-globules and fatty granules. Vast numbers of young mussels appeared in all the nets, the younger forms swimming actively, especially before the formation of the shell. At the mouth of the Tay the small-shelled forms make a notable deposit, but scarcely a single example is fitted for bait. Indeed, they are dredged in bulk and sent elsewhere to people suitable beds. On the other hand, they grow more rapidly off Castle Gilroy and the eastern end of Broughty Ferry. These and the mussels of the Eden thus form the main source of the swarms of pelagic young of St. Andrews Bay, and which by-and-by settle in countless myriads on rocks and other surfaces.

In this month *Pilidium*, the larval stage of a Nemertean (one of the Anopla) was occasionally procured, with *Mitraria* the remarkable larva of the Polychæt *Ammochares* and also *Tornaria* the larva of *Balanoglossus*. In the south *Arachnactis*, again, is caught generally below 20 metres (*Russell*), whereas in the Zetlandic waters it is in vast swarms as a surface-form in quiet weather.

A transition is effected between the summer and the autumn faunas at Plymouth. *Rhizosolenia* and the Dinoflagellates (*Ceratium*, *Peridinium*) are common. The Anthomedusæ are represented by *Sarsia* and *Podocoryne*, the Leptomedusæ by *Laodice*, *Obelia*, and in the Channel by *Saphenia*; *Muggiæa* (*Diphyes*) becomes plentiful at the end of the month. Larvæ of *Chætopterus* are met with, and Balanid *Nauplii* and *Evadne*, again, are numerous. Echinoid *Plutei* are also obtained (*Prof. Garstang*). Dr. Lebour adds the Medusoid *Irene viridula*, Eschscholtz, and the young of the Crustacean *Gebia*.

Prof. Johnstone gives *Rhizosolenia*, *Ceratium*, *Noctiluca*, *Calanus finmarchicus*, *Oithona similis*, and *Temora longicornis* as the maximal forms in the Irish Sea.

The different forms of Anthomedusæ and Leptomedusæ off Cullercoats seem to reach their maximum in July, and *Aglantha* (Trachomedusæ) occurs in abundance at all stages the same month—thus much earlier than at St. Andrews, where it is mainly a winter-form. *Limacina retroversa* is common this month *. Young examples of *Pœcilochætus*, *Magelona*, and *Chætopterus* also occurred. It is interesting that *Tomopteris helgolandica* (*T. kefersteini*) is the species met with during the warm months at Cullercoats, whereas that most abundant at St. Andrews is *T. catharina*. It is supposed by some that *T. helgolandica* (=*T. kefersteini*) is the young form of *T. catharina*, the second pair of tentacles being shed as it reaches the adult stage. Whilst it is always smaller than the species last mentioned, no facts bearing out this view have yet been obtained at St. Andrews. From May to July *Zoeæ* and *Megalops* stages of Decapoda and Macrura abounded, but *Munida* was rare as at

---

* Rep. Dove Mar. Lab. 1923.

St. Andrews, whilst *Upogebia* and *Callianassa* were characteristic of the southern area. The Mysidæ seem to be more frequent at St. Andrews. Amphipods were, on the whole, more abundant at St. Andrews—probably from the proximity of the rocky shores. The Copepods are similar in both areas.

In the Clyde *Phialidium* and *Corymorpha* were still the prominent Medusæ, whilst *Pleurobrachia* had made its appearance. Small *Sagittæ* were common. The condition thus deviated from St. Andrews in the late appearance of the latter forms and in the presence of *Fritillaria.*

Little can be added to the pelagic captures of August already published (*q.v.*). The pelagic fauna in every group was plentiful, and extended far beyond the Bay to the Bell Rock and south to the Isle of May. Dense masses of *Pleurobrachia* of all sizes, though the majority were small, appeared off the Eden. A tow-net attached to the trawl captured post-larval fishes, whilst the trawl held larger forms of considerable size, showing that in some instances both were in the same area, just as a *Cyanea* of 3 feet in diameter occasionally occurred with the younger bluish forms of a diameter of five inches. So abundant were these and other Medusæ that the triangular mid-water net anchored the boat and they filled the salmon stake-nets. The maximum of such marine life seemed to hover between August and September in ordinary years—as at Plymouth.

Prof. Garstang observes that in variety and intrinsic interest August and September are perhaps the richest in the year, the sea in August having the maximum temperature. *Radiolaria, Muggiæa, Geryonia, Evadne,* and *Doliolum* occur in numbers. Müller's larva in shoals, *Pilidium,* Annelid larvæ (*Polydora, Pectinaria, Magelona, Chætopterus,* and occasionally *Polygordius*) are all procured. Gastropod larvæ—*Rissoa, Ægirus, Cirropteron, Actinotrocha,* Cirripede larvæ (*Sacculina*), Echinoderm larvæ (*Plutei,* large *Bipinnariæ*), *Tornaria,* and the larvæ of *Amphioxus* are common. *Amphinema* and *Podocoryne* are conspicuous amongst the Anthomedusæ, and *Saphenia, Laodice,* and *Obelia* amongst the Leptomedusæ. Dinoflagellates and Diatoms (*Rhizosolenia*) are plentiful.

Mr. Bles had previously obtained the young of *Muggiæa* (*Diphyes*). In the pelagic food of young fishes Dr. Lebour found the same Copepods as in the previous month with their Nauplii, besides *Centropages, Halosphæra,* and *Coscinodiscus,* small Mysids, shrimps, Amphipods, and larval Gastropods. *Limacina* abounded and *Anomalocera* was not uncommon.

Prof. Johnstone states that about the end of August, and even in September and October, the Diatoms again increase. His maximal form in August is *Centropages hamatus.*

In the Clyde a few more Medusæ appeared with *Ophioplutei* and *Echinoplutei,* whilst *Bipinnaria* was rare. Sagittæ were frequent. *Oikopleura* was common, and *Fritillaria* rare.

Besides the account of September in the Report of the Fishery Board, curious Algoids were found by Mr. Holt (1889) in the mid-water net, each consisting of four or five spherical bodies of a greenish tinge and rather opaque. The greenish tinge appears to be in the rounded masses composing the spheres.

Mr. Bles * procured the larvæ of *Magelona* at Plymouth on the 5th, but it was rare at the end of the month. He also notes Müller's larva, young *Amphioxus* and a young Polyclad, the Copepods *Euterpe*, *Corycæus*, and *Cetochilus*, but *Noctiluca* was very rare. The Dinoflagellates increased at the end of the month.

Prof. Garstang considered that the floating fauna differed little from that of the preceding month. *Laodice* and *Saphenia* disappeared, and *Willia* appeared. All the other forms mentioned in August maintain their abundance, except the Radiolarians, Bipinnarians, and *Tornaria*. Terebellid larvæ have increased in numbers. Larvæ of *Muggiæa*, *Cephalothrix*, and *Thalassema* are met with, as also Muller's larva, *Pilidium*, the larvæ of *Magelona*, *Chætopterus*, *Rissoa*, and *Ægirus*. Swarms of Rotifers and the Diatom *Chætoceros* likewise occurred.

In the Clyde *Bolina* was sometimes abundant, *Cyphonautes* increased towards the end of the month. *Oikopleura* was fairly common and *Fritillaria* rare.

The northern area is distinguished by the absence of *Amphioxus* and *Noctiluca*, but the larvæ of Annelids are similar in both areas, though the stages may be less advanced at St. Andrews. *Muggiæa*, again, is confined to the southern region. The pelagic Crustacea in the Clyde did not differ much from those on the eastern shores.

As indicated formerly, pelagic life was in considerable abundance in October. In contrast with the waters at Plymouth the mid-water and bottom nets produced many Ctenophores—*Pleurobrachia* and *Beroë*. Pelagic Echinoderms were now rare, but larval Annelids, as in the southern waters, abounded, amongst others a Spionid-like Claparède's with white pigment at the sides, whilst a *Tornaria*-like larva "with minute bristles" swam with the blunt end and eyes in front. In the bottom-nets were advanced specimens of Claparède's larva with the lower division of the foot present, and bristles which approach those of the Spionids or Ariciidæ. In the bottom-net on the 28th two larvæ of *Polygordius* were captured. Occasionally swarms of *Tomopteris* (as in 1815) were obtained in the mid-water nets.

Prof. Garstang states that a change occurs in October in regard to the plenitude of the pelagic fauna. The diatom *Chætoceros* is the most abundant, and the alga *Halosphæra* reappears. Dinoflagellates are plentiful, and a few Radiolaria may be met with. *Cytæandra*, *Eutima*, and *Irene* represent the Medusæ. Nemertine larvæ (*Cephalothrix*), Polychæt larvæ (*Polynoë*, *Chætopterus*, *Polydora*, and *Terebella*) are still present. *Cyphonautes* and Lamellibranchs are numerous (as, indeed, throughout the year),

---

* Journ. M. B. A. 1891-92 (1893).

Decapod (Brachyura) larvæ are scarce, but *Sagitta* and a few *Plutei* may be taken.

Dr. Lebour mentions that the tow-nets contained a large number of larval Gastropods, *Limacina*, and bivalves, besides *Acartia*, *Calanus*, *Temora*, *Centropages typicus*, *Oithona*, *Candacia*, and *Podon*. *Evadne*, again, produced the single large winter egg.

The maximal forms of Prof. Johnstone during the month in the Irish Sea were pelagic larvæ of various Lamellibranchs, which were very numerous between September and April, a very large number appearing in March 1919. The Gastropod larvæ, on the other hand, had high numbers at the beginning and end of the year. Besides these *Rhizosolenia setigera*, gonophores of various Hydromedusæ, *Paracalanus parvus*, and *Pseudocalanus elongatus* were common. Leschke finds the larvæ of *Capitella* in October and November at Kiel, whereas they appear earlier at St. Andrews.

In the Clyde *Phialidium* and *Obelia* were the representatives of the Medusæ. *Bolina* was still present, and *Sagittæ* common. *Fritillaria* increased, whilst *Oikopleura* diminished.

During November the surface-nets contained many examples of *Ceratium tripos* and *Pleurobrachia*—both young and old—as well as ova. On the 8th November, 1892, the tow-nets captured swarms of the *Megalops*-stage of *Porcellana* and young Norway lobsters. There were also a few Sagittæ and Copepods. At the end of the month in 1889 *Thaumantias melanops* occurred, and next year several Hydromedusæ—turned inside out.

The bottom-nets were more prolific, though none of the *Megalops*-stage of *Porcellana* occurred in them. Swarms of *Pleurobrachia*, both young and old from $\frac{1}{16}$ inch to $\frac{3}{4}$ inch, were present on the 9th, besides Sagittæ of good size and small Tomopterids. *Aglantha* was frequently met with. Numerous trochophores of Polynoids and also older forms with scales were obtained towards the end of the month. Gobies of 18 to 23 mm., and young herrings 16–18 mm., likewise occurred in these nets. At Kiel Leschke notes that the *Polydora*-larvæ have almost disappeared, though a few occur throughout the winter with isolated larvæ of *Capitella*. At St. Andrews, on the other hand, trochophores and older stages of Polynoids with bristles and scales, and *Nerine*-larvæ and swarms of Copepods were met with.

Clausia elongata and *Coryceus anglicus* were conspicuous Copepods at Plymouth, *Longipedia coronata* and *Harpactius chelifer* were rare. *Spadella* was small, and only one Tomopterid occurred. Post-larval stages of Polychæts were numerous, but Echinoderm larvæ were rare. *Cyphonautes* was fairly numerous with *Muggiæa*. *Ceratium* and *Obelia* were few (*Hodgson*). The impoverishment continues at Plymouth. There is a great scarcity of Medusæ, veligers, and zoeæ. The larvæ least rare are those of Polychæts, Cirripedes, *Macrura*, and *Cyphonautes*. The larvæ of *Cephalothrix* and a few *Plutei* may occur (*Prof. Garstang*).

Prof. Johnstone observes that there is a general poverty of life in the sea from November to March. Diatoms and Peridinians are absent with certain qualifications, and Copepods are scarce. His maximal forms are the diatom *Biddulphia sinensis* and the pelagic larvæ of various Gastropods. His experiences and those of his colleagues, Messrs. Scott and Chadwick, moreover, cover fourteen years.

In the Clyde *Phialidium* and *Bolina* were common, *Tomopteris* was taken occasionally, *Fritillaria* at the end of the month supplanted *Oikopleura.*

The mid-water net in December captured numbers of *Aglantha* of both sexes—from the beginning of the month onward. They swam with a swift jerking motion—apex first,—the contractions of the disc sending the water backward, their motions being quicker than those of the ordinary Medusæ such as *Thaumantias.* Their reproductive organs were well developed, but no free sperms were observed. Young examples of *Tima bairdi*, Johnston, about 1 inch, and others up to 3 inches in diameter, were frequent, the tentacles being partly fawn-coloured as Forbes shows. Examples of *Turris digitalis* also occurred, one with pale pinkish masses above the eight slightly brownish and "furbelowed" radii; the masses resembled canary-seeds, and were faintly granular externally. During mid-winter a huge *Cyanea* occasionally may be caught at a depth of 15 to 20 fathoms off the Bay—a solitary survivor of the swarms of summer. *Beroë* appeared occasionally 1¼ inches long with the reproductive elements along the ctenophoral canals.

In the bottom-nets were swarms of *Pleurobrachia* (6th Dec.), a few *Lesueuriæ* which emitted a steel-blue phosphorescence, besides examples of *Aglantha, Turris*, and *Thaumantias hemisphærica.* A few Sagittæ were also present, besides swarms of Copepods and a few examples of *Evadne* and *Podon.*

Leschke at Kiel found larvæ of *Spio*, whilst the Capitellæ reached their maximum at the end of the month and then disappeared. Isolated examples of *Nephthys*-larvæ were also present.

Medusæ are rare or absent at Plymouth. Annelid trochophores and Opisthobranch veligers show signs of increase. *Cyphonautes* is still present (*Prof. Garstang*). Mr. Hodgson mentions *Oithona spinirostris* and *Candace pectinata*, Brady, with numerous examples of *Spadella* increasing in size. *Muggiæa* disappeared about the middle of the month. *Ceratium* had increased, and there were fair numbers of Radiolaria, a few Rotifers, but *Noctiluca* was rare (*Mr. Hodgson*).

In the Clyde *Bolina* was present in large numbers. *Phialidium* was the only common Medusa. *Tomopteris* was rare, but *Fritillaria* remained common.

So far as the records go, the captures in December at St. Andrews appear to be more plentiful than at Plymouth, especially as regards the Cœlenterates. On the whole, these observations show how widely distributed the species of the pelagic fauna are, only a few, such as *Noctiluca*, the Siphonophores, *Salpa*, *Fritillaria*, and

Amphioxus, being diagnostic of certain southern regions. Moreover, careful investigation shows that many forms occur from month to month throughout the entire year—now at the bottom, now in mid-water, and again at the surface. Indeed, the study of the pelagic fauna affords an endless field for inquiry. Further, its close connection with the food of post-larval and young food-fishes is another feature of importance, and indicates the inscrutable ways of Nature in the sea, ways which often seem to be calamitous for instance in the fisheries, but which sooner or later result in the permanence of the supply. The investigations of the late Prof. Sir William Herdman on the Copepods and Plankton in general further emphasize the wide distribution of the common forms in our waters, and the foregoing, as well as previous remarks, indicate that in every month of the year pelagic forms of all kinds abound, and that the breeding season of many coincides with the presence of larval and post-larval food-fishes. Thus suitable food is provided for these all round our coasts as well as in the waters beyond.

2. *Further Remarks on the Occurrence of* Sagitta bipunctata, *Quoy & Gaimard.*

In treating of the pelagic fauna of the Bay of St. Andrews during the months of 1888 the Chætognaths were thus referred to *. Sagittæ of various sizes were prevalent during January, and some were large, with developing reproductive organs. It was during January many years ago that my mother found the west sands, for a mile or more, strewn with fine living examples which sparkled in the setting sun along the beach like needles of glass. They were formerly considered somewhat rare, but they are really amongst the most abundant marine animals. Some on January 4th had the reproductive organs small, but the ova were visible. They measured from 11 to 19 mm. In the same month of 1889 vast swarms occurred in the bottom-net, and were from 6 to 20 mm. in length.

In February Sagittæ were extremely abundant, especially in the mid-water net, and in almost mature condition. Moreover, several showed a larval trematode in front of the caudal septum. The large specimens in the mid-water net measured 1⅛ in., and the same size was seen in both surface- and bottom-nets, and on the 6th they swarmed in the latter. One had the gullet extruded. Another had a solid process projecting from the female aperture of one side.

Both small and large Sagittæ, the latter reaching fully an inch, occurred in March. They abounded in the mid-water- and bottom-nets, and occasionally reached the surface. This and the two previous months produced 27 bottles of the species, just three less than those from the other nine months. Sagittæ have been found in the stomachs of several food-fishes, and are probably eaten by most, so that their importance in this respect is considerable. On the 7th March great numbers occurred in the bottom-net, the majority about 10 or 11 mm. long, and amongst them were many young herrings which resembled their surroundings except for the eyes. Swarms of young Copepods and a few adults accompanied them. It is not often that so many Sagittæ nearly equal in size occur. Other captures throughout the month gave specimens from 13 to 22 mm., so that no particular size could be predicted for the month. The examples measuring 10–11 mm. could not be very old, probably produced from eggs in January and February, though there are few data to show the exact rate of growth.

---

* 7th Ann. Rep. Fishery Board, part iii. p. 262.

Sagittæ were on the whole no less conspicuous in April, since in 1892 the bottom-net brought up a tangled mass of Sagittæ and *Oikopleura*, larval herrings, and other fishes with swarms of Copepods—young and old. The Sagittæ measured from 5–10 mm. About the same date in 1896 the Sagittæ likewise swarmed, but of a larger size, viz., from 10–24 mm. There were fewer *Oikopleuræ*. A collection on the 26th differed from that of the 19th in the presence of only a single *Sagitta* of 21 mm. and in the swarm of smaller forms.

In May they appeared in the surface-net occasionally, but they were smaller—¼ to ½ inch. In the mid-water net they were more abundant and the range in size greater, viz., from ¼ to 1 inch. They were captured in all the nets throughout the month in small numbers.

Comparatively few were obtained in June, and these chiefly in the bottom-nets, their sizes ranging from 10 to 18 mm. Sometimes only two or three were present, and from 10 to 14 mm. On the whole, they were of a larger size than in April.

In June the examples were procured chiefly in the mid-water- and bottom-nets, and they were comparatively few on the 10th, 11th, and 24th of 1888, their size ranging between 10 and 18 mm.; but on the 4th June, 1889, they were more numerous in the bottom-net, amidst a multitude of other forms, the size ranging from 6 to 16 mm.

In July they were equally inconspicuous, those captured occurring amidst swarms of Copepods with *Evadne* and *Podon*. Whilst comparatively few were met with in the Bay and from 7 to 10 mm. in length; they were in larger numbers in 20 fathoms in the Estuary of the Forth, and from 12 to 15 mm. long.

Few were caught in the mid-water net in the Bay in August, and these were from 12 to 16 mm. in length. On the other hand, swarms occurred in the mid-water net S.E. of the Isle of May, but of a similar size. That careful and accurate observer, Prof. G. Busk *, states that *S. bipunctata* "appears to be in a state of most complete maturity in August and September," his remarks applying to the southern area.

---

* Quart. Journ. Mic. Sc., Oct. 1855, p. 15.

Those captured in September were few in number in each of the five instances from the 13th to the 28th, and were all secured in the mid-water net. They were comparatively small—10 to 14 mm.

In October Sagittæ were obtained sparingly in the bottom-net in the earlier part of the month, but at the end (24th and 26th) they were in vast swarms in this net, and ranged from 5 to 25 mm. Only on one occasion were a few obtained in the mid-water net.

During November Sagittæ of about ¾ of an inch occurred in all the nets, and often in great abundance in the bottom-nets. A considerable number of smaller forms (8 mm.) were present amongst the larger. On the 8th (1892) a swarm ranging from 6 to 21 mm. occurred in the bottom-net.

The Sagittæ were remarkably numerous and of large size in December both in the surface-nets and in the bottom-nets, but not always in correspondence; thus the record of the surface-net on the 5th, 13th, 14th, and 18th was "numerous, few, many, few." whilst in the bottom-net it was "few, many, many, few" on the same dates. In the mid-water net they were especially abundant and large, ranging from 16 to 21 mm., and the reproductive organs were well developed. They formed a conspicuous element in the food of the various fishes at this season.

Dr. F. S. Russell* at Plymouth, while observing that the majority of the examples of *Sagitta bipunctata* from April 8th till July 1st were captured from the deeper layers below 20 or 25 metres, yet on dates in May, June, and July they were considerably higher in the water. He noted that the smaller stages were most prevalent in the upper layers. They were present in small numbers in April, May, and June, but showed an enormous increase in the middle of July, and still more of an increase on August 6th. It is difficult, however, to attach much weight to these irregularities of level.

Taking a general survey of the nets during the year the following is the result †:—

Mid-water-net. First appearance 16th January, a few good. *Last appearance* 18th December, in swarms (12 to 21 mm.). Some showed sperm-cells and large ovaries. *Most plentiful.* Many in October, but multitudes in December.

Bottom-net. First appearance 21st January, a few about 1 inch. *Last appearance* 18th December. *Most plentiful* from beginning of December to end of March.

Surface-net. First appearance 21st January, a few ½ inch long. *Last appearance* 18th December, a few of various sizes. *Most plentiful* in December—many, as a rule, each time.

---

* Journ. M. B. A. n. s. xiv., March 1927, p. 377.

† 8th Rep. S. F. B. part iii. p. 271.

In the comparatively shallow water of St. Andrews Bay conclusions as to the distribution at various depths are of little value. Sagittæ, indeed, occurred in all the nets throughout the year, yet swarms of the larger forms were most frequent in the mid-water- and bottom-nets. It has to be remembered that vast numbers of the larger forms may be beached alive on the sand, so that caution is necessary in predicating as to depth. In the North Atlantic Dr. R. Gunther* found the larger forms more numerous in the deeper waters—800 to 1700 fathoms.

There is little doubt that many of the smaller examples at and below 6 and 7 mm. escaped through the apertures of the net, for they were seldom encountered throughout the year unless entangled in a mass of other pelagic organisms. From June to September small forms in the collection were either absent or very rare; though the observations of a year or two are not decisive, yet the comparison of these months with the captures in October are striking. In the Clyde while *Sagitta* occurs all the year round it attains its maximum in July, thus differing from St. Andrews.

Some authors, such as Mr. Doncaster, express doubts as to the definite fixation of the species, and the latter gives the instance of *Sagitta lyra* at maturity with only three hooks (jaws) from depths of 400 to 1000 fathoms†, whereas the ordinary form has seven. No such divergence, however, has been seen in *S. bipunctata* in British seas as that figured by E. L. Michael‡ with the posterior fin approaching the tail so closely as scarcely to leave space for the male apertures.

The expansion of the cephalic region is peculiar, since the large hooks (jaws) which ordinarily are at the sides of the head apart from the mouth, and with their points curving forward, now lie on the inner edge of a cushion on each side with their points projecting inward. Such can only be accomplished by muscular action and the elasticity of the tissues—which alters the facies of the parts and enables the hooks to grasp the food,—their (hooks) direction being inward and slightly forward, a transverse muscle again aiding in the return to the original position.

A peculiar injury was found in one about three-quarters of an inch long, which presented a fissure extending forward from the posterior part of the head to the frontal border, thus severing the head into two irregular halves, the left, moreover, being damaged. The long hooks on the right were nearly normal; those on the left moiety before mounting were directed to the right, but when mounted they fell into a nearly normal position. A row of twelve small hooks was present on the right half; all the others were absent. The specimen seemed to have rallied from this severe lesion and to have been feeding.

The parasites of *Sagitta* have long been observed by various authors, one of the most recent being Dr. Lebour at Plymouth At St. Andrews two forms have been met with, viz., an *Ascaris* and a Trematode (*Derogenes varicus*, O. F. M.). Both are sufficiently described by Dr. Lebour, *Sagitta* acting as an intermediate host. The final host in each case has yet to be discovered. Nematodes abound to a great depth in many parts of the sea. The examples of *Derogenes* at St. Andrews presented ova, as in one instance noted by Dr. Lebour. The young Ascarids are sometimes coiled up near the vent, whereas the older forms may stretch three-quarters the length of the *Sagitta*.

---

* Ann. & Mag Nat. Hist. (7) vol. xii. p. 334.

† *Vide* Gerarda Wynhoff, Zool. Anz., 18th Aug. 1914, p. 24.

‡ Classif. & Vertic. Distrib. Chætognaths of San Diego, 1911.

Sagittæ are voracious feeders, and, besides prey readily recognized, the intestine is often filled with pulpy masses of an indefinite character. Dr. Lebour and Mr. Andrew Scott state that they feed on young fishes. This has not been observed at St. Andrews, but they have often been found with examples of their own species—sometimes two—partially engulfed. These and Tomopterids seem to be favourite food. In some cases the prey (*Sagitta*) is seized by the middle, so that head and tail project in front. Dr. Thomas Scott, again, mentions that they feed on *Calanus finmarchicus* and *Phoxus plumosus*, and certainly they frequently are accompanied by swarms of Copepods of all sizes. On the other hand, the polyps of *Obelia* readily seize the smaller examples of *Sagitta* and digest them, as Dr. A. T. Masterman † has shown.

The remarkable tips to the great hooks (jaws) seem to be provided for a special purpose, and form an unique feature in the group. The organs appear to be hollow up to the base of the distal process, but whether the glands at the base supply a special secretion in this connection is unknown.

It would be difficult to assign a spawning-period to *Sagitta bipunctata* at St. Andrews from an examination of preserved specimens throughout the months of the year as in the present observations. Young forms occur during most of the months, so that, at any rate, the spawning-period is prolonged. Grassi found them spawning in summer, and F. S. Conant mentions spawning on the American shores in March, July, and August. At St. Andrews an egg with a gelatinous coating, to which sand-grains adhered, appeared in the tow-nets in March, and this in all probability was that of *Sagitta*. Numerous young of 7 and 8 mm. were obtained in April, May, and June. Certainly in October great numbers of young from 6 to 8 mm. were obtained, and these probably were hatched in the previous month or in August. In November young forms of the same length were common; whereas in December the larger examples (16 to 21 mm.) alone were captured. Such, however, may be exceptional. Other authors such as Oscar Hertwig mention spring, and he developed the ova up to the gastrula-stage. L. Doncaster got the eggs of *S. bipunctata* in May and June, and again from the 1st of November to the

---

* Journ. Mar. Biol. Assoc. vol. xi. no. 2, p. 201 with text-figs. (1917).

† Ann. & Mag. Nat. Hist., May 1894, p. 410.

11th of December at the Puntano near Messina, and they hatched variously in from 15 to 50 hours. The egg contains a large perivitelline space, and the newly-hatched larva is only 1 mm. in length, thus easily passing through most nets, and this perhaps explains why so few minute forms come under ordinary observation. In the Clyde area E. T. Browne took *S. bipunctata* in every month throughout the year. Up to the end of February he found only adults (20 to 28 mm.). These died off during March and April. About the beginning of March early stages (2 mm.) appeared, and reached maturity in September and October, the breeding-season extending over two months. *Sagitta* was scarce up to the end of June in the Clyde, became more common in July (5–10 mm.), was scarce during August and September (10–15 mm.). In October early stages appeared (3–5 mm.). In November they became abundant (he thought from immigration), but after the middle they were scarce, whilst in December only large specimens (15–20 mm.) were got.

A comparison of Mr. E. T. Browne's careful observations in January and February with those at St. Andrews shows that various sizes occurred at St. Andrews, whereas only adults appeared in the Clyde. He found very young forms in March, those at St. Andrews being about 10–11 mm. and in great numbers. Sagittæ in both areas were less conspicuous in summer. In both areas small forms are common, but larger and more numerous at St. Andrews. In November they swarmed in both areas, but not from immigration at St. Andrews. In both areas large examples were common in December (16–21 mm.). Mr. Browne's observations would point at least to two spawning-periods, viz., in March and October, and so far as the captures at St. Andrews indicate such would appear to be probable, though extension at both extremities of each period may be necessary.

E. M. Michael considers that intense light sends *Sagitta bipunctata* down and subdued light sends it toward the surface, and similar views have been expressed by others dealing with the group. The work at St. Andrews was carried on by day, so that there was no opportunity of contrasting it with the condition in darkness.

So far as observed, only one species of *Sagitta*, viz. *S. bipunctata*, Quoy & Gaimard, occurs at St. Andrews, and the genus is readily distinguished by its two pairs of lateral fins and two rows of teeth. *Spadella*, again, has one pair of lateral fins on the tail-segment and two rows of teeth; whilst *Krohnia* has one pair of fins extending on trunk and tail and one row of teeth.

3. *On a Parasitic Growth on the Tail of* Sagitta *and in a Cirrus of* Hermadion *from the 'Challenger.'*

From January to March and April a peculiar parasitic structure, which in the spirit-preparations was opaque white, occurred on the caudal region of the larger Sagittæ, and seemed to be very prevalent

(Pl. I. figs. 3–8). The parasitic structure on the tip of the tail presents diverse appearances, sometimes cylindrical or widening as it proceeds outward so as to assume a club-shaped outline (Pl. I. figs. 3 & 5), and extending from the centre of the tip or from one side. Again, the mass involving the caudal fin may be bilobed distally, either with or without scattered portions toward the tip of the body, thus interfering with the functions of the parts. In some the tumour arose on the side a little in front of the tip (Pl. I. fig. 5) and involved the web of that side. In others the pedicled process is free from the web of the fin—probably as an early stage. In a few the tumour projects on both sides of the caudal web. In advanced cases the mass encroaches on the body and, enlarging, resembles a cephalic region, only traces of the caudal rays being visible—perhaps at a single point. Occasionally the mass sends out a tulip-like process from the botryoidal surface, or a flattened blade with a ragged extremity occurs distally. In a few the central mass, which sometimes exceeded the diameter of the tail, had a rough surface. In the early condition a few small granular masses are seen at the tip in the median line and mingled with the long delicate fibres or rays of the caudal fin, to which they tenaciously cling—a feature frequently noticed in the progress of the disease. In minute structure these early cells do not differ from those of the more advanced stages, so that one might suppose they carried the infection; but this is conjecture. Certain examples when interfered with separate as minute, rounded, glistening balls (Pl. I. fig. 7). So far as observed most of the growths appeared on the ventral surface, though the discrimination was not readily made.

The parasitic structure on the tail consists of minute granular cells (Pl. I. fig. 8) aggregated into masses of various sizes, and often presenting a smooth external wall, as in the rounded forms which easily separate on interference. These granular cells seem to proliferate with rapidity to form the masses which, starting from the tail, invade the fibres of the web and assume the various outlines figured. They have been termed granular, but by focussing the interior appears as if folded in a complex manner, probably from the crowding of the nuclei, and many smaller cells indicate the rapid growth of the tumours.

It is interesting that, so far as observed, only the larger forms of *Sagitta* were affected by the disease, but in great numbers. Moreover, the lateral fins have not been observed to suffer, the tip of the tail being apparently the vulnerable region.

So far as ascertained, no previous author who has studied the Chætognaths, in home or foreign waters, has noticed this disease, which affects large numbers of these pelagic forms. It probably spreads from one to another, and appears always to affect the tail, the functions of which, in the advanced cases, it must seriously cripple. Such an affection seems to be rare in marine forms, the only analogous one which has come under observation being a parasitic whitish body at the base of a dorsal cirrus of *Hermadion* *kerguelensis*, M'I., dredged by the 'Challenger' near Kerguelen, and in *Nychia cirrosa*, Pallas, from Holsteinborg. Whilst in appearance the former at first sight approached that found in *Sagitta* (Pl. I. fig. 9), a closer inspection showed that the rounded mass was imbedded in the tissues of the cirrus enclosed in a capsule, which was easily ruptured. Moreover, the constituent bodies were elliptical or ovoid in shape (Pl. I. fig. 10), somewhat like the ova of a *Distomum*, of uniform size, and presented longitudinal streaks by transmitted light. The tumour appeared to be of rapid growth, and the contained elliptical bodies would spread it widely around, just as the granular cells do in the case of *Sagitta*. Allied structures, viz., the ova of *Heterodera schachtii*, Schmidt, are figured by Dr. A. Strubell*, and, indeed, the ova of Distoms have a general resemblance to those found in the *Hermadion* from Kerguelen, which may act as an intermediate host in the case.

4. *On a South African* Sagitta *and the Proportional Size of the Central Nervous System.*

Procured at the following stations:—

No. 60. U 271 Stat. 48. 33° 36' 30" S., 19° 30' 00" E. Gn M.†

No. 59. U 573 K Stat. 84, 33° 46' 00" S. 500 fathoms, Gn S.

No. 61. 513 A Stat. 77, 33° 48' 30" S., 17° 07' 00" E. 735 fathoms, Gl O.

No. 57. U 573 Stat. 84, 33° 46' 00" S., 17° 13' 00" E. 500 fathoms, Gn S.

No. 62. Stat. 84, 32° 46' 00" S., 17° 13' 00" E. 500 fathoms, Gn M.

All the specimens appear to belong to the same species, which has a wide distribution at the Cape. The best-preserved example (Pl. I. fig. 1) measures 40 mm. in length and fully 6 mm. across the wide fin, whilst the rigid and solid body has a transverse diameter of 4 mm. The head is large and rounded, the body narrowing behind it, then dilating, and again narrowing toward the extremity, which has a somewhat broad tail-fin, the latter passing forward almost to the male aperture. The posterior fins are broad, but become narrower as they go forward, and connected by a thin web with the head. Thus no lateral margin of the body is devoid of this extension, for the the tail-fin is joined to the posterior fin by a similar web.

The head has anteriorly two blunt peaks and dorsally a ridge passes forward to each, whilst in the middle line are two sharp parallel longitudinal elevations. Moreover, the central nervous system is (Pl. I. fig. 2) clearly seen from the outside as a median ganglion, which sends two trunks forward—one to the inner side of each frontal peak, whilst a larger branch on each side slopes obliquely backward to join the ventral ganglion. The dorsal surface of the head is the more convex, the ventral being grooved by the mouth and its adjacent parts. The large hooks or jaws are of a lustrous dark brown colour and are closely applied to the lateral region. The smaller teeth number four in front and thirteen behind. The collar stretches from each lateral region and ensheaths the posterior part of the head ventrally, and runs forward and upward to merge in the lateral region outside the peaks.

---

* Untersuch. Rubennematoden, Frankfurt-a.-M. 1888, Taf. ii. fig. 30.

† Gn S. Coarse sand; Gl O. *Globigerina*-ooze; Gn M. Stony mud.

Ventrally the anterior peaks of the head are even more prominent than dorsally. The mouth forms a central depression of a somewhat ovoid shape, the roof marked by a groove running from between the peaks backward. The posterior edge or lips project prominently in lateral view. The hooks (jaws) have the usual basis with a flange and are curved throughout, the curve being accentuated toward the tip, and each presents a sheathed extremity. The inner edge is sharp and the outer thick and strong, and an intermediate stout process is present.

The massive body differs from that of the ordinary forms, such as *S. bipunctata*, in having a dorsal and a ventral median furrow instead of the lateral depression—indicating the separation between the dorsal and the ventral sheets of longitudinal muscle. Such is probably due to the massive and continuous arrangement of these muscles.

The female apertures project outward as pointed papillæ, and in one example ova had, probably by rupture, passed into the perivisceral space. In another a mass of sperms was in the male aperture on each side.

The example had been so prepared in formalin that the cephalic ganglion on the dorsal surface and the ventral ganglion on the opposite surface (Pl. I. fig. 1) were clearly seen without dissection, for which I have to thank the late Prof. J. D. Gilchrist. From the fused cephalic mass two branches went forward to supply the buccal region, two trunks (one from each side) passed obliquely outward and backward to join the ventral ganglion, whilst three—a median and two lateral—all in close proximity left the centre of the posterior border, the lateral, which had a slight slope outward, probably supplying the eye on each side, though these were invisible in the preparation. The ventral ganglion was also much smaller than usually figured, and its branches were numerous. It may be thought that this large stout species has exceptionally small ganglia, but there is no reason to doubt its typical arrangement.

The representation of the nervous system of *Sagitta* is sometimes more or less diagrammatic—even in the monagraph of Grassi such is the case [*], for his figures give little idea of the proportion to the surrounding parts. Oscar Hertwig's [†] figure of the head of *Sagitta bipunctata* shows the cephalic ganglion about a third the breadth of the head, and its branches differ from the South

---

[*] 'I Chetognati,' B. Grassi. 1883, *e. g.* pl. iii. fig. 1.

[†] 'Studien zur Blattertheorie,' Heft. ii. Die Chætognathen: Jena, 1880.

African form, since the ocular trunks come from the posterior angles of the ganglion at a distance from the median. In Prof. Joubin's * figure also the abdominal ganglion is rather large. The figure of the cephalic ganglion of *Sagitta magna*, given by P. Langerhans † is much too large, and the same may be said of Dr. R. Gunther's ‡ outline in his interesting and elaborate paper on the systematic position of the Chætognatha.

In vol. iv. of the 'Marine Investigations in South Africa' an account of the Chætognaths is given by P. T. Cleve, in which he enters six species, viz., *Krohnia hamata*, *Sagitta bipunctata*, *S. enflata*, *S. furcata*, *S. magna*, and *S. serrulata*—a new species 1 centimetre in length, in which the hooks have a denticulate edge, but none of these agrees with the present examples.

In outline this form somewhat approaches Burfield and Harvey's figure of *Sagitta planktonis*, Steinhaus, from the Indian Ocean, the massive body of which has a web from the head joining the two anterior fins, but it does not extend to the tail as in the South African species. The gap between the two anterior fins varies in length according to the British authors quoted, and it was much longer than in their figure. The jaws or large hooks range from seven to nine, the anterior teeth vary from four to ten, the posterior from eight to nineteen. The *S. magna* of Langerhans from Madeira appears to be closely allied, but the author gives no particulars about the fins. The anterior teeth are four in number, the posterior two to three, whilst the jaws vary from seven to nine. P. T. Cleve mentions that the whole animal is soft and transparent, which could not be said of the single massive form under review. He gives the number of jaws as five, the anterior teeth as three, and the posterior two.

On the whole, it most nearly approaches the latter species, though the absence of a figure in Langerhans's paper, as well as the differences indicated in the description, render the position doubtful. Moreover, changes in the extension of the web connecting the fins may take place in some species.

EXPLANATION OF PLATE I.

Fig. 1. Slightly enlarged figure of *Sagitta* from South Africa.

Fig. 2. Enlarged outline of the cephalic region of the foregoing, showing the ganglion and its branches from the dorsal surface.

Figs. 3, 4, 5, & 6. Various examples of the parasitic disease of the tail-fin of *Sagitta bipunctata*, Q. & G.

Fig. 7. A rounded parasitic mass which separated from an affected tail on interference.

Fig. 8. Minute structure of the tumour on the tail. × 360 diam.

Fig. 9. Parasitic mass in the cirrus of *Hermadion kerguelensis*, M'I. × 30 diam.

Fig. 10. Minute structure of the foregoing. × 360 diam.

---

* Bull. Mus. Oceanogr. Monaco, 1905. pp. 51 & 89.

† Zeit. f. w. Zool. Bd. xxxiv. Taf. vi. figs. 57 & 60.

‡ Quart. J. Micros. Sc. vol. li. fig. B, p. 61 (1907).

II.—*The Species of the Genus* Stenomicra, *Coquillet* (*Diptera, Acalyptrata*). By J. R. Malloch.

[Plate II.]

Some time ago I received from Dr. G. A. K. Marshall some specimens of an acalyptrate fly for identification that puzzled me very considerably, and, though I had a very distinct recollection of having seen either the same or a very similar form, I failed for some time to trace it. Ultimately, however, I succeeded in finding the other specimens, and below I present my conclusions regarding them.

The genus *Stenomicra,* Coquillett, was originally described for the reception of a species from Porto Rico, *angustata,* Coquillett, and placed in the family Drosophilidæ *.

In dealing with the family Drosophilidæ Sturtevant rejected *Stenomicra,* considering it as probably belonging to the Geomyzidæ †.

I have made a very careful examination of the genotype of *Stenomicra* as well as the other species now on hand, and the characters seem to point to as close a relationship with Drosophilidæ as with Geomyzidæ, though there are some species of Anthomyzidæ which bear a strong resemblance to *Stenomicra* in the head-structure. The whole question of the relationships of the various groups in this section requires very careful consideration to determine their exact status. Hendel has recently attempted to clarify the matter, but, even with the assistance of his synopsis, it is impossible to place the present genus satisfactorily. I incline to the opinion that there are too many families in the division, and consider that, when a single character, such as the presence or absence, or the inclination, of a pair of bristles, or the degree of individuality of a vein, is resorted to in separating groups of families, the number of exceptions met with precludes the possibility of a workable classification. An examination of the figure of the wing of *Stenomicra* presented herein will show that in this feature at least the genus bears a very strong resemblance to *Drosophila,* having no differentiated basal or anal cells, which are present in typical Anthomyzidæ. The head is shown in Pl. II. fig. 1, and here there is a departure from the typical Drosophiline form in the lack of forwardly directed orbital bristles and distinct ocellars. The postvertical bristles are microscopic, but in most specimens they are evident under a high-power lens, and divergent, while the inner vertical pair are directed forward and upward, which is quite exceptional. Other remarkable features of the frontal structure are the small size of the ocelli, their close approximation, and their distance from vertex (Pl. II. figs. 1 & 11). The uppermost pair of bristles on the face cannot be considered as vibrissæ, but appear to be analogous to those occurring in some genera of Ephydridæ. It appears to me with the material now in hand that *Stenomicra* bears as close a relationship to Asteiidæ as to Drosophilidæ, and, if we consider the similarity in the inclination of the postvertical bristles as well as the slightly forwardly directed inner verticals of Asteiidæ as of importance, it is more closely related to that group than to Anthomyzidæ. Pending a definite conclusion on the matter, I leave the genus in the complex containing Drosophilidæ and Asteiidæ. The single puparium before me appears to strengthen this conclusion.

---

* Proc. U.S. National Museum, vol. xxii. p. 262 (1900).

† 'The North American Species of *Drosophila,*' p. 49, 1921.

In *Stenomicra* the palpi are vestigial, being visible only after clearing in a weak solution of potassium hydroxide as minute rounded processes.

I have before me, in addition to the species from Australia sent to me by Dr. Marshall, the genotype which is in the collection of the United States National Museum, a species from Hawaii, and another from the Philippines sent to me by Dr. C. F. Baker of the Philippine College of Agriculture.

Key to the Species.

1. Second costal division (the one beyond apex of first vein) not much longer than third; wing hyaline	*angustata*, Coq.
Second costal division at least three times as long as third	2.
2. Wing largely fuscous with four whitish fasciæ, one near base, one over each of the cross-veins, and another near apex, the latter interrupted in middle; distance between apices of veins 2 and 3 and 3 and 4 on costa subequal (Pl. II. fig. 10)	*fascipennis*, sp. n.
Wing hyaline; distances between apices of veins 2 and 3 much greater than that between apices of veins 3 and 4 on costa	3.
3. Male hypopygium with the forceps long and rather conspicuously attenuated on apical half (Pl. II. fig. 4), and the longest of the internal processes as in Pl. II. fig. 5	*australis*, sp. n.
Male hypopygium with the forceps shorter and gradually tapered (Pl. II. fig. 6), and the longest of the internal processes as in Pl. II. fig. 9	*orientalis*, sp. n.

Stenomicra australis, sp. n.

Male and *female*.—Testaceous yellow, slightly shining. Frons paler than rest of head, with a black ocellar spot. Thorax variably brownish on dorsum, and usually with a dark mark on upper part of pleura, the mesonotum lightly whitish-dusted. Abdomen in female as in Pl. II. fig. 3, that of male with third and fourth tergites, and the hypopygium, blackened. Legs testaceous, apical segment of fore tarsi fuscous. Wings clear. Halteres yellow. Hairs and bristles luteous.

Head as in Pl. II. fig. 1, face almost conically protruded; cheeks with a series of conspicuous setulæ which are continued to apex of facial prominence, the apical two longest and about equally as far from each other as either is from eye; frons as in fig. 2; eyes with short stiff pale hairs. Thorax with two pairs of postsutural dorso-central bristles, and in front of these in continuation of the series short pale hairs, one series of similar hairs on median line, and no prescutellar acrostichals; scutellum convex, slightly elongated, bare on disc, and with two apical bristles; sternopleura with one bristle; mesopleura bare. Male hypopygium as in Pl. II. figs. 4 & 5. Fore femur with two or three quite strong postero-ventral bristles beyond middle; no preapical dorsal bristle on tibiæ. Wing as in Pl. II. fig. 6.

Length 1·5–2 mm.

Type, allotype, and six paratypes, Kalbo, Innisfail, Queensland, 14. vii. 1926 (*J. L. Froggatt*).

Along with the adults there is an empty puparium attached to a piece of banana-leaf, the larvæ occurring on this plant. The puparium is 6 mm. in length, about 1·5 in width at the widest point, and somewhat boat-shaped owing to the sharp central ridge which runs the whole length of the dorsal surface. This ridge may not be evident in the larvæ. The general colour is testaceous with dark markings as shown in Pl. II. fig. 7, and the surface is microscopically granulose.

Stenomicra orientalis, sp. n.

Male and *female*.—Similar in colour to the preceding species, but darker, and with the hypopygium different, the forceps shorter and stouter (Pl. II. fig. 8), and the longest of the internal processes quite noticeably spatulate (Pl. II. fig. 9).

Length 1·75–2 mm.

Type and one paratype, Mt. View, Hawaii, 14. iii. 1922 (*O. H. Swezey*); paratypes, Puna, Hawaii, 20. ix. 1918

(*O. H. Swezey*), Kaumana, Hawaii, 25. x. 1908, in fragmentary condition, and two which I dissected, Oahu, Hawaii, 19. iii. 1908, labelled "in cane."

Stenomicra fascipennis, sp. n.

Male.—Head fuscous, with light whitish dusting; antennæ brownish testaceous. Thorax fuscous, slightly shining, with light whitish dust on dorsum, the lower parts of pleura testaceous. Abdomen fuscous, yellowish below. Legs testaceous yellow. Wings fuscous, marked as in Pl. II. fig. 10. Halteres yellow.

The frons differs from that of the other species in having two strong orbitals (Pl. II. fig. 11), and, if my interpretation of the damaged type is correct, the inner verticals are much shorter. The other characters are very similar in all the species, but the wing-venation of *fascipennis* is quite different from that of the others (Pl. II. fig. 10).

Length 1·5 mm.

Type, Mt. Maquiling, Luzon Province, Philippine Islands (*C. F. Baker*).

EXPLANATION OF PLATE II.

Fig. 1. *Stenomicra australis*, head from the side.
Fig. 2. —— ——, frons from front.
Fig. 3. —— ——, abdomen of female.
Fig. 4. —— ——, hypopygium of male from above.
Fig. 5. —— ——, longer internal hypopygial process.
Fig. 6. —— ——, wing.
Fig. 7. —— ——, puparium, dorsal view.
Fig. 8. —— *orientalis*, hopopygial forceps.
Fig. 9. —— ——, longer internal hypopygial process.
Fig. 10. —— *fascipennis*, wing.
Fig. 11. —— ——, frons from front.

III.—Acipenser persicus, *a Sturgeon from the Caspian Sea.*

By N. Borodin.

[Plate III.]

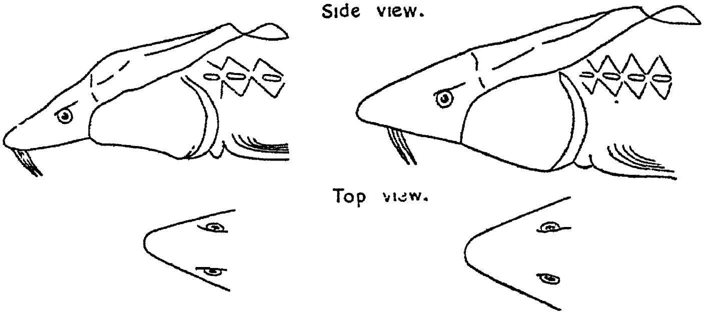
In a Russian magazine, 'Westnik Rybopromyshlenosti,' January 1897, I published a description, accompanied by a drawing of *Acipenser persicus*, a new species of Sturgeon from the Caspian Sea. Dr. L. Berg considered *Acipenser persicus* to be a synonym of *Acipenser güldenstädtii*, Brant (Berg, 'Fauna Rossica, Pisces,' i. p. 246).

I remain of the opinion that it is a distinct species, or subspecies, and I think it worth while to publish the description and drawing of this species in a publication attainable to every zoologist.

Acipenser persicus. (Pl. III.*)

Characteristics.—Maximum depth of the body one-eighth of its length; lateral bony shields 31–34.

Description. — Body elongate, somewhat compressed, becoming gradually thinner posteriorly, without the sharp decline from a thick and high anterior portion of the body near the head, found in *A. güldenstädtii.* Body covered with many star-like bony plates arranged in rows. Head with a sharp descending upper profile. Snout obtuse, projecting downwards and resembling a kind of trunk. When the mouth is closed a depression is formed, which can be seen from the side (see text-fig.). A large star-like shield covers about three-quarters of the operculum. Pectoral 1–24.



Acipenser persicus. *Acipenser güldenstädtii.*

Heads of the two species of Sturgeons.

In *A. güldenstädtii* the body is round (not compressed), its depth is one-sixth of the length; there is a sharp decline of the profile from the head to the tail; the snout is triangular and the barbels are further from its tip; the shields and plates on the body between the principal rows are not so numerous, are smaller, and are cross-shaped (not star-shaped); the lateral shields number 38–39 (instead of

---

* Photo made from a specimen from the South Caspian Sea.

31–34). Here follows a table of measurements in centimetres of two specimens of each species:—

	A. persicus.	*A. güldenst.*	*A. persicus.*	*A. güldenst.*
Length (standard)..	92	77	111	109
Head length	16	12	19	21
Body depth	11	10	12	15

Besides morphological characteristics there is a great difference in the life-history and the geographical distribution of the two species. *A. güldenstädtii* ascends the Ural River (for spawning) in the month of April and spawns in late April and the beginning of May, whereas *A. persicus* ascends the same river in May and spawns in June. *A. persicus* averages larger than *A. güldenstädtii.* It is more numerous in the southern part of the Caspian Sea, near its Persian coasts, but is comparatively scarce in the Ural River and is not known in the Volga River. The fishermen distinguish both species without any hesitation, so different are they even at first sight.

IV.—*On the Cynodont Reptile* Tribolodon frerensis, *Seeley.*

By George Gaylord Simpson.

Introduction.

In 1895 H. G. Seeley published a figure which he described in his legend as "Internal aspect of the dentary bone of *Tribolodon* from Lady Frere, showing the angle of the jaw and the coronoid process. The other bones which compose the lower jaw are lost from the slightly grooved surface exposed. The teeth are remarkable for their distance from each other and height above the alveolar margin" (Seeley, 1895, pl. lxxxviii. figs. 6–7). In the following year the same authority gave a detailed description of the dentary bone on which the figure was based, and assigned to it the name *Tribolodon frerensis* (Seeley, 1896, p. 146). He concluded his remarks on the jaw with the words "The distant position of the teeth; their vertical exposure above the alveolar margin; the longitudinal deflection of the minor cusps of the crown are distinctive features, as are the limitation of the cusps to three in number, and the great vertical development of the coronoid process." Although Seeley always considered *Tribolodon* to be a reptile, and, indeed, first figured it as a typical example of the cynodont dentition, it has since sometimes been supposed to be a mammal. Thus in the most recent edition of the standard 'Grundzüge' (Schlosser-Zittel, 1923, p. 437) *Tribolodon* is placed in the family Dromatheriidæ among the polyprotodont marsupials.

Restudy of the original specimen shows beyond question that the animal was a reptile, as Seeley believed, but that the dental peculiarities which he assigned to it were erroneous. Its cheek-teeth present, moreover, an entirely new type of structure, differing fundamentally from that of any other known reptiles or mammals. A brief re-description of the specimen and elucidation of this very distinctive dental character seem, therefore, quite necessary.

DESCRIPTION.

The type and only known specimen is R 2583 in the Geology Department of the British Museum (Natural History). It was found in the Triassic Upper Karoo Formation at Lady Frere in Cape Colony and presented to the Museum by H. G. Seeley in 1895. The larger part of the left dentary, with three cheek-teeth, is preserved, only the internal aspect being visible as it lies in the very hard matrix.

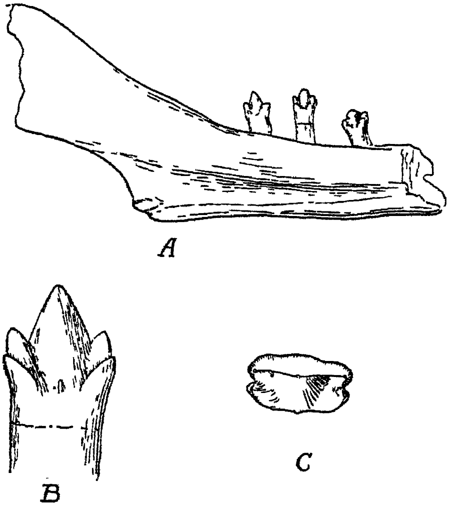
Dentary.—Back of the straight and relatively slender tooth-bearing portion of the dentary rises the long and lofty coronoid process, curving upward from the alveolar border without making a definite angulation with the latter. At about the level of the alveoli the posterior end of the bone is produced into a pseudo-articular process which extends almost as far posteriorly as the apex of the coronoid. The disparity between them was originally greater, however, for the pseudo-articular process seems to be essentially complete, whilst the coronoid is slightly broken. Between the two there seems to have been a shallow emargination—the edge here is now somewhat ragged and broken, but it probably is not far from following the original contour.

The inner surface of the dentary in the region of the cheek-teeth is marked by a distinct groove, which passes backward, becoming broader as it does so. It is bounded superiorly by a large rounded ridge, which becomes rapidly less prominent back of the tooth-bearing portion, and passes towards but does not quite reach the extremity of the pseudo-articular process. Inferiorly the groove is bounded by a narrower but equally high ridge which passes back in a straight line, without becoming less prominent, to a point a little less than half of the distance from the posterior of the three preserved teeth to the end of the bone and there terminates at the apex of the distinct angular process. Although well developed, the angular process does not project freely backward as in most mammals, and is separated from the pseudo-articular process only by a broad and shallow emargination. Just above the posterior termination of the lower ridge on the angle there is a small bead-like swelling.

The whole posterior portion of the coronoid and pseudo-articular processes is flat and featureless, and the latter bears no articular condyle, nor is there any trace of a support for one.

Dentition.—The specimen presents a type of cheek-tooth elsewhere entirely unknown. The lesser cusps suffered very badly at the time of the original discovery or preparation, but the general character of the teeth can be established without question. There is a main, trenchant, central cusp which is somewhat compressed laterally, and there are small equal anterior and posterior accessory cusps in the same longitudinal series. This was all that was brought out by Seeley, and would make the tooth-type very ordinary, resembling especially that of *Thrinaxodon*. It has been previously overlooked, however, that there are two more cusps on each tooth—one directly internal to each of the previously mentioned accessory cusps. They are lower on the crown than the latter, but are of equal size, and they make the crown quinque-cuspidate in a unique way. The only approach to this type of tooth is in the upper molars of certain Jurassic triconodont mammals, but the resemblance is very distant and the parts not homologous. On one of the teeth a tiny nodule may be seen internal to the main cusp and between the antero-internal and postero-internal cusps; on the two other teeth this region is broken.

Seeley supposed the widely spaced character of the teeth and their remarkable emergence from their alveoli to be original features, but here again he was certainly led astray. The teeth were very loose in their alveoli at the time when the jaw was buried, and they have nearly fallen out, large portions of the normally intra-alveolar parts of the roots being visible. The middle of the three teeth preserved is the farthest out of its alveolus, the anterior the least. The enamelled portion of the tooth ends only a short distance below the cusps (as indicated by a light transverse line in the figure, B), and the part of the tooth below this point was certainly within the alveolus in life. Nor is the wide spacing natural—it is merely due to the fact that some of the loose teeth have fallen out altogether. There was at least one more anterior to the first one preserved, while there were two between it and the middle preserved one, one between the middle and posterior ones, and one back of the latter. The alveoli of these teeth can be made out with perfect clearness, and they indicate that the part of the dentary preserved contained eight cheek-teeth in a closely crowded series. There may, of course, have been others anterior to these.



Tribolodon frerensis, Seeley. Holotype, Brit. Mus. (Nat. Hist.), R 2583.
A, entire specimen, natural size; B, single molar, restored, internal aspect, enlarged five times; C, same, superior aspect.

The roots of the preserved teeth are single, slightly compressed transversely, but without longitudinal grooving or any other definite evidence of incipient root-division.

AFFINITIES.

In considering whether *Tribolodon* is a reptile or a mammal the following facts are pertinent:—

1. The apparent articular process did not really serve for articulation, and did not terminate in a condyle.
2. There is a longitudinal groove along the inner face of the dentary which is exactly like that of some

reptiles, where it lodges the splenial and other accessory jaw elements.
3. There is no dental foramen such as is always found in the lower jaws of mammals.
4. The cheek-teeth show no trace of root-division.

It is obvious that the jaw is reptilian, and cannot possibly be considered to be that of a mammal. As regards its position within the class Reptilia, the following characters are diagnostic :—

1. The post-dental portion of the dentary is very large, and terminates in three distinct processes—coronoid, pseudo-articular, and angular.
2. The splenial and other accessory jaw elements were not closely united with the dentary, but lay loosely in a groove along the internal face of the latter.
3. The cheek-teeth have a definite and well differentiated cusp-pattern.

From these characters it is apparent that *Tribolodon* is a member of the group Cynodontia, and one must return unreservedly to the original opinion of Seeley in this respect.

As to its taxonomic place in the Cynodontia, the teeth of *Tribolodon* are so peculiar that some knowledge of the skull would be necessary for decision. Presumably, however, its allies must be sought among the various members of the predaceous series, exemplified by *Galesaurus, Thrinaxodon,* or *Cynognathus*, rather than in the more unified non-predaceous series typified by *Diademodon.* Its dental characters once more and very strikingly emphasize the high development of cusp-differentiation in the cynodonts and the variety of their dental adaptations.

In conclusion, the writer wishes to express his thanks to the authorities of the British Museum (Natural History), and especially to Dr. F. A. Bather and Mr. W. E. Swinton, for the opportunity of studying this specimen.

CITATIONS.

SCHLOSSER, M. 1923. "Mammalia" in Zittel's 'Grundzüge der Paläontologie.' 4th ed. Munich and Berlin.

SEELEY, H. G. 1895. "Researches on the Structure, Organization, and Classification of the Fossil Reptilia. Part IX. Section 1. On the Therosuchia." Phil. Trans. Roy. Soc. B, vol. 185.

——. 1896. *Ibid.* Part IX. Section 5. "On the Skeleton in new Cynodontia from the Karroo Rocks." *Loc. cit.* vol. 186.

V.—*New or little-known* Tipulidæ (*Diptera*).—XXXV. *Australasian Species.* By CHARLES P. ALEXANDER, Ph.D., F.E.S., Massachusetts Agricultural College, Amherst, Massachusetts, U.S.A.

IN the present paper, further descriptions of Australian and Tasmanian species of the genus *Molophilus* are given. The majority of these species belong to the typical subgroup of the *gracilis* group, the type-form of which (*gracilis*, Skuse) was figured in Part XXXIII. of this series of papers (Ann. & Mag. Nat. Hist. ser. 9, vol. xix. p. 17; 1927). In this subgroup, the male hypopygium is characterized by the unusual development of the individual lobes of the basistyle, the dorsal, ventral, and mesal lobes being variously developed, the two dististyles lying in the notch formed by these lobes. The subgroup is very numerous in species in Australia and Tasmania.

The greater number of the species described herein were collected by Drs. Ferguson, Mackerras, and Tonnoir, to whom the respective types have been returned. Additional material belonging to the University of Queensland was collected by Mr. Hardy, and to the Riksmuseet in Stockholm by Dr. Mjöberg, the latter sent to me through the kind interest of Dr. Sjöstedt. I am further indebted to Dr. Ferguson and Dr. Mackerras for invaluable co-operation in making known the identities of the species of *Molophilus* described by Skuse (1889) and now preserved in the Macleay Collection of the University of Sydney. The writer's sincere thanks are extended to all of the above gentlemen for this aid and co-operation.

Molophilus aciferus, sp. n.

Belongs to the *gracilis* group and subgroup; antennæ short; head dark brown; thorax brown; knobs of halteres yellow; fore tibia (♂) narrowly dilated but not darkened subbasally; male hypopygium with basistyle deeply split into three lobes, the dorso-lateral with setæ virtually to the tip; both dististyles acutely pointed at apices; ædeagus long and slender.

Male.—Length 3·7–4 mm.; wing 4·4–5 mm.

Rostrum and palpi dark brown. Antennæ short, if bent backward not extending far beyond the wing-root; scapal segments pale brown; flagellum dark brown, the segments oval, gradually decreasing in size outwardly, clothed with a conspicuous, erect, silvery pubescence and black, unilaterally-arranged verticils. Head dull dark brown.

Lateral pretergites narrowly and inconspicuously pale yellow. Mesonotum rather uniformly brown or greyish brown, dull, without markings. Pleura dark brown. Halteres pale at base, the stem clothed with dark setæ, the knobs conspicuously light yellow, clothed with silken yellow setæ. Legs with the coxæ testaceous brown, the trochanters paler ; remainder of legs brown, clothed with dark setæ, the tarsi passing into dark brown; fore tibia (♂) near base dilated but not darkened. Wings broad, tinged with brown, the base more yellowish; veins slightly darker than the ground-colour; macrotrichiæ dark brown, grouped into a dense conspicuous spot at the fork of *M*, with smaller clusters along the anterior cord and at the fork of M_{3+4}. Venation: vein *2nd A* ending about opposite one-fourth the length of M_{3+4}.

Abdomen dark brown, including the hypopygium. Male hypopygium with the basistyle profoundly cut into three lobes, the dististyli borne in the notch ; dorso-lateral lobe slender, narrowed to the sub-acute apex, the surface to apex with scattered setæ ; ventro-lateral lobe stouter and more clavate, slightly thickened distally, the lateral face with strong scattered setæ, the apex and mesal face with dense long delicate setæ that tend to become retrorse ; mesal lobe of basistyle broad and flattened, the apex narrowed. Outer dististyle directed dorsad and mesad, dilated before mid-length and here provided with a few microscopic setulæ, beyond this point curved, in slide-mounts appearing to be bent almost at a right angle, narrowed and blackened to the acute point, the angle of curvature expanded into a wing. Inner dististyle nearly as long but more slender, gradually narrowed distally, the apical fourth or a little less suddenly narrowed into a black, gently curved, needle-like point. Ædeagus pale, slender, in slides extending to the apex of the mesal lobe of the basistyle.

Hab. Tasmania.

Holotype, ♂, Hartz Mts., December 10, 1922 (*A. Tonnoir*).

Paratypes, ♂, Cradle Valley, altitude 3500 feet, January 24, 1923 ; ♂, Zeehan, February 7, 1923 ; ♂, Mt. Field, December 19, 1922 ; ♂, Eaglehawk Neck, Tasman Peninsula, November 18, 1922 (*A. Tonnoir*).

Molophilus difficilis, sp. n.

Belongs to the *gracilis* group and subgroup; antennæ elongate; male hypopygium with the dorso-lateral lobe of basistyle produced into a long, slender, glabrous point; mesal lobe low and pointed; outer dististyle moderately long, sinuous, chitinized, at tip suddenly narrowed into a long straight point; inner dististyle obtuse at apex; ædeagus short.

Male.—Length about 4·5 mm.; wing 5·5 mm.; antenna about 3·6 mm.

Rostrum and palpi brownish black. Antennæ brownish black throughout, elongate, as shown by the measurements; flagellar segments elongate-fusiform, with pale outspreading setæ. Head dark, grey pruinose.

Sides of the pronotum obscure yellow. Mesonotum uniformly dark brown, the humeral region not brightened, testaceous as far as the pseudosutural foveæ, thence as a very narrow line to the wing-root; scutellum paler testaceous brown. Pleura brownish black, pruinose. Halteres pale, the knobs pale yellow. Legs with the coxæ brownish testaceous, paler apically; trochanters yellow; remainder of legs dark brown, the femora indistinctly paler at base; fore tibia (♂) slightly swollen sub-basally, but not differently coloured. Wings with a strong brownish tinge, a little darker along the cord, along vein *Rs* and vein *Cu* to the wing-margin; veins darker brown. Venation: *r* on R_{2+3} some distance beyond *r–m*, the basal section of R_{2+3} being subequal to the petiole of cell M_3; vein *2nd A* ending just beyond the cephalic end of *m–cu*.

Abdomen dark brown, including the hypogygium. Male hypopygium with the dorso-lateral lobe of the basistyle produced apically into a slender chitinized point without setæ; ventro-lateral lobe subequal in length but stouter, clavate, the setæ about as in *aciferus*; mesal lobe reduced to a low, conical, setiferous hump. Outer dististyle a slender, chitinized, blackened rod of moderate length, sinuous, the apex abruptly produced laterad into a long, slender, blackened spine that is more than one-third the length of the remainder of the style. Inner dististyle flattened, when viewed laterally, dilated at the outer end. Ædeagus very short and gently curved.

Hab. Tasmania.

Holotype, ♂, probably Hobart, 1924 (*G. H. Hardy*); Collector's No. 353. Type in the University of Queensland Collection.

Paratype, ♂, Mt. Wellington, November 25, 1922 (*A. Tonnoir*). The paratype has been returned to Dr. Tonnoir.

Molophilus exsertus, sp. n.

Belongs to the *gracilis* group and subgroup, most closely related to *M. difficilis*, sp. n.; size smaller, antennæ proportionately shorter; male hypopygium with the style very long and slender, exserted, the outer dististyle pale, the chitinized apical spine less than one-eighth the length of the remainder of the style.

Male.—Length about 3·5 mm.; wing 4·6–4·8 mm.; antenna about 2·4 mm.

Rostrum and palpi brownish black. Antennæ elongate, if bent backward extending to far beyond the base of the abdomen, black throughout; flagellar segments long-fusiform, with conspicuous erect pubescence. Head dark grey.

Pronotum and lateral pretergites conspicuously light sulphur-yellow. Mesonotum dark brown, the humeral region of the præscutum with a small yellow triangle, the lateral margin of the sclerite behind this vaguely and narrowly pale; scutellum obscure reddish brown. Pleura dark brown, sparsely grey pruinose; two small yellow sclerites at wing-base. Halteres yellow, the knobs with silken yellow setæ. Legs with the fore coxæ dark, the other coxæ and trochanters pale; remainder of the legs brownish black, the femoral bases narrowly pale; fore tibia (♂) a trifle dilated near base. Wings with a pale brownish tinge, the base more yellowish; veins darker brown; macrotrichiæ dark brown, the costal and apical fringe long and dense; a dense patch of trichiæ at fork of *M* producing a spot at that point. Venation: *r* on R_{2+3} beyond the level of *r–m*; basal section of R_{2+3} about two-thirds the petiole of cell M_3; vein *2nd A* ending about opposite the caudal end of *m–cu*.

Abdomen dark brown, including the conspicuous hypopygium. Male hypopygium with the styli very long and attenuate, conspicuous. Basistyles deeply trifid, the parts very similar to *M. difficilis*, but all more slender and exserted; dorsal lobe of basistyle produced into a glabrous flattened blade; ventral lateral lobe a little longer with delicate retrorse setæ on the ventral face; mesal lobe more elongate-conical than in *difficilis*. Outer dististyle very long and slender, pale throughout, almost straight, very slightly enlarged outwardly, the tip suddenly produced into a small slender black point, this not more than one-eighth the length of the remainder of the style. Inner dististyle shorter, extending caudad about to the level of the longer lobes of the basistyle, the apex narrowly obtuse, blackened. Ædeagus short, not extending far beyond the base of the mesal lobe of the basistyle.

Hab. Tasmania.

Holotype, ♂, Wilmot, January 8, 1923 (*A. Tonnoir*).

Paratypes, 4 ♂ ♂, Burnie, January 31, 1923 (*A. Tonnoir*).

Molophilus forceps, sp. n.

Belongs to the *gracilis* group and subgroup; general coloration of præscutum reddish brown, darker brown medially; pleura dark brown; head dark brownish grey; male hypopygium with the dorsal lobe of the basistyle lacking; mesal lobe terminating in a long blackened spine that is directed laterad; inner dististyle flattened, terminating in two acute spines, the whole structure appearing pincer-like.

Male.—Length about 3 mm.; wing 4 mm.

Rostrum and palpi black. Antennæ broken. Head dark brownish grey.

Pronotum dark brown. Mesonotal præscutum reddish brown, the humeral region brighter, the median area darker brown; anterior lateral pretergite narrowly sulphur-yellow; remainder of mesonotum light reddish brown, the postnotum darker brown. Pleura shiny dark brown. Halteres pale brown, the base of the stem narrowly yellowish, the knobs darker-coloured. Legs with the coxæ and trochanters brownish testaceous; only a single (middle) leg remains, dark brown, the femora paler at base. Wings with a brownish-yellow tinge, the veins and macrotrichiæ darker brown. Venation: vein *2nd A* relatively short, ending just before the caudal end of *m–cu*.

Abdomen dark brown. Male hypopygium with the dorsal lobe of the basistyle very reduced or lacking; ventral and mesal lobes well-developed, the ventral lobe moderately stout, fleshy, the usual retrorse to erect setæ sparse but stout; mesal lobe extensive, the apex narrowed, terminating in a slender blackened spine, the tip of which is directly laterad. Dististyle two, occupying the hollow of the basistyle; outer dististyle relatively small, flattened, the apical third more narrowed, with a few weak denticles near the base of the narrowed portion. Inner dististyle a powerful blade that terminates in two long acute spines that are curved gently toward one another, the whole structure appearing pincer-like; outer spine a little longer and more heavily chitinized; inner spine somewhat paler and with several microscopic punctures near the base, these continued basad on to the broad disk of the style (about 18 in number, the outermost beyond mid-length of the spine). Ædeagus of moderate length, a little shorter than the inner dististyle, slender.

Hab. New South Wales.

Holotype, ♂, Blackheath, Blue Mts., altitude 3500 feet, January 26, 1922 (*E. W. Ferguson*); No. 74.

Paratype, ♂, in the Skuse Collection as paratype No. 1 of *Molophilus lucidipennis*, Skuse, labelled "B.M.," probably "Blue Mts."—*Mackerras*.

Type returned to Dr. Ferguson; paratype in the Macleay Collection.

M. forceps is very different in hypopygial structure from *M. lucidipennis*, Skuse, the two species being confused in the type-series of the latter.

Molophilus horridus, sp. n.

Belongs to the *gracilis* group and subgroup; antennæ short; head light grey; halteres with light yellow knobs; wings with a broad, pale brown cloud along cord; male hypopygium with the dorsal lateral angle of basistyle produced into a slender chitinized spine; outer dististyle a powerful chitinized spine, dilated near mid-length, the lateral margin produced into a shorter curved spine.

Male.—Length about 4–4·2 mm.; wing 5·3–6·1 mm.

Rostrum and palpi brownish black. Antennæ short, if bent backward not extending far beyond the wing-root; antennæ dark brown; flagellar segments oval, clothed with a dense white pubescence and a few longer black setæ. Head light grey.

Pronotum yellow, the lateral pretergites of the same colour, continued narrowly to the wing-root. Mesonotum brown, with a reddish cast, the humeral region of the præscutum a trifle brightened; pseudosutural foveæ elongate, reddish brown; scutellum medially broadly yellowish. Pleura dark brownish grey. Halteres pale, the knobs conspicuously light yellow. Legs with the coxæ and trochanters pale brown; femora brownish yellow, the tips dark brown; tibiæ yellow, the bases and tips narrowly infuscated; fore tibiæ (♂) with a dilated black ring near base; tarsi brownish black. Wings relatively broad, pale brownish yellow, the base and costal region clearer yellow; a broad darker brown cloud along the cord; macrotrichiæ relatively sparse and of moderate length only, dark brown;

veins pale, the prearcular veins, *Sc*, *R*, and Cu_1 more yellowish, the veins in the darkened discal area darker brown. Venation: *r* lying shortly beyond the level of *r–m*; basal section of R_{2+3} about one-fifth shorter than the petiole of cell M_3; vein *2nd A* moderately long, extending to shortly beyond the proximal end of *m–cu*.

Abdomen dark brown, including the hypopygium, the longest dististyle more yellowish. Male hypopygium of the general structure of the group, the basistyle trifid; dorso-lateral lobe produced into a slender needle-like point that in a position of rest is directed caudad and then ventrad, but in slides is directed laterad; ventro-lateral lobe very small, the setal arrangement as in the group; mesal lobe a little larger than usual, widened distally to the truncated apex. Outer dististyle a powerful and conspicuous flattened blade that extends out into a strong black spine, the lateral margin of the style just beyond mid-length produced into a smaller curved spine, in some cases this spine more nearly straightened, the margin in the axil feebly denticulate; mesal edge of style nearer base feebly bellied out. Inner dististyle shorter, heavily chitinized, produced into a long slender point, the margin weakly serrulate. Ædeagus of moderate length, straight, and rather stout. Ninth tergite with the caudo-lateral angle produced into a small laterally directed point.

Hab. Victoria, Tasmania.

Holotype, ♂, National Park, Tasmania, December 16, 1922 (*A. Tonnoir*).

Paratypes, 2 ♂♂, Sassafras, Dandenong Range, Victoria, altitude 1000 feet, October 21–22, 1922 (*A. Tonnoir*).

Molophilus fergusonianus, sp. n.

Belongs to the *gracilis* group and subgroup; general coloration of præscutum reddish brown, with a darker brown median stripe; scutellum obscure yellow; male hypopygium with the dorsal lobe of the basistyle a long slender spine; ventral lobe very reduced; outer dististyle bifid near apex, the outer margin serrulate; inner dististyle acute at tip, the lateral margin beyond mid-length with a strong lateral spine.

Male.—Length about 5 mm.; wing 6 mm.

Rostrum and palpi black. Antennæ relatively long, if bent backward extending to beyond the wing-root; scapal segments brownish yellow, the flagellar segments black, long-oval, with a conspicuous erect white pubescence in addition to the long verticils. Head light brownish grey.

Pronotum obscure yellow, more greyish dorsally. Lateral pretergites light sulphur-yellow. Mesonotal præscutum reddish brown with a darker brown median stripe; pseudosutural foveæ brownish black; scutum dark brown, greyish medially; scutellum obscure yellow; postnotum light brown, sparsely pruinose, the lateral margin of the mediotergite and the dorsal half of the pleurotergite lighter brown. Pleura dark brown, the sternal portions paler. Halteres pale, the knobs light yellow. Legs with the coxæ and trochanters obscure yellow; femora yellow, passing into yellowish brown; tibiæ pale brown, fore tibia (♂) with a conspicuous dark brown swollen ring; tarsi brown. Wings with a faint brown tinge, the veins darker brown; macrotrichiæ dark brown; a darker brown cloud at fork of *M* and on *m–cu*. Venation: vein *2nd A* sinuous, ending about opposite mid-length of the obliquely sinuous *m–cu*.

Abdomen light brown, the hypopygium more yellowish. Male hypopygium very different in structure from any species described. Basistyles relatively stout, the dorsal apical portion projecting beyond the bases of the dististyles to form a sort of sheath, the apical portion of this extension of the style glabrous; dorsal spine extremely long, slender, exceeding in length the other elements of the hypopygium, gradually narrowed to the acute tip, the base inserted on a level with the origin of the dististyles; what appears to represent the mesal lobe of the basistyle is very small, slender, terminating in a blackened spine, the outer face of the style with a few scattered setæ, together with more abundant microscopic setulæ; what appears to be the ventral lobe of the basistyle is reduced to a low and blunt but extensive region of the style. Outer dististyle with the basal half pale and semitransparent, hidden beneath the sheathing extension of the basistyle, the exposed distal half entirely blackened, narrowly and gently curved to the acute apex, before the tip with a conspicuous lateral spine; lateral margin of the style microscopically serrulate. Inner dististyle larger, appearing as a powerful blade, more expanded beyond mid-length and here bearing on the lateral margin a powerful smooth spine, the apex beyond this spine blackened, gently curved to the acute tip, the lateral or ventral surface microscopically serrulate. Ædeagus relatively short, not as long as the dististyles.

Hab. New South Wales.

Holotype, ♂, Sydney, December 2, 1923 (*F. W. Ferguson*); No. 76.

This very distinct fly finds its closest relative in *M. gracilis*, Skuse. The fly is dedicated to the collector, Dr. E. W. Ferguson, to whom I am indebted for invaluable aid in making known the crane-fly fauna of Australia.

Molophilus aphanta, sp. n.

Belongs to the *gracilis* group and subgroup; antennæ short; anterior mesonotum ochreous yellow, darkened behind, the pleura dark brown; halteres with yellow knobs; wings with a faint brownish tinge; male hypopygium with the dorso-lateral lobe of the basistyle short and obtuse; mesal lobe very large and flattened, covered with tiny setæ, the apex acute and blackened; inner dististyle a powerful black arm terminating in a dilated, acutely pointed head.

Male.—Length about 2·8–3 mm.; wing 4·2 mm.

Rostrum and palpi brownish black. Antennæ of moderate length, if bent backward extending about to the wing-root; basal segments pale, the terminal segments of the flagellum passing into brown; flagellar segments with elongate verticils that are from two to three times the length of the segments. Head dark brownish grey.

Mesonotum light ochreous to fulvous-yellow, the scutellum and especially the postnotum darker. Pleura conspicuously dark brown, contrasting with the brighter colour of the mesonotum. Halteres pale at base, the stem with dark setæ, the knobs yellow. Legs with the coxæ and trochanters yellow; femora yellow, with appressed brown setæ that do not affect the colour of the segment; tibiæ brownish yellow, fore tibia (♂) with a slightly swollen subbasal area; tarsi pale brown, only the two terminal segments darker brown. Wings with a faint brown tinge, the wing-base more yellowish; wing-axil a little infuscated; cord vaguely darkened; veins a little darker brown, macrotrichiæ dark brown, moderately long and sparse. Venation: Sc_1 ending some distance beyond *r*, the latter lying almost in alignment with *r–m*; anal region of wing relatively narrow, the cells narrow and the veins lying close together; vein *2nd A* ending about opposite the cephalic end of *m–cu*.

Abdomen dark brown. Male hypopygium with the basistyle deeply trilobed, the dorsal lobe shortest, broad and obtusely rounded at apex, the surface with large scattered setæ to the tip, the mesal surface with additional delicate erect setulæ; ventral lobe extending further caudad, slender, pale, the mesal face with dense erect or slightly retrorse setæ of different sizes, the lateral face with a few scattered setæ; mesal lobe very broad and flattened, extending caudad into a small blackened acute point, the surface of the lobe densely covered with delicate setulæ. Outer dististyle relatively slender, directed caudad, the basal two-thirds expanded and paler in colour, the apical third suddenly narrowed into a gently curved black spine. Inner dististyle longer and larger, in a position of rest directed cephalad, slender, gently curved, at the apex dilated slightly, thence narrowed to the acute apex; outer margin of the dilated portion with a tiny appressed tooth. Ædeagus relatively long, straight, and slender, yellow, in slides extending caudad to slightly beyond the apex of the mesal lobe.

Hab. Victoria.

Holotype, ♂, Sassafras, Dandenong Range, altitude 1000 feet, October 19, 1922 (*A. Tonnoir*).

Molophilus micracantha, sp. n.

Belongs to the *gracilis* group and subgroup; general coloration dark brown, including the pronotum; halteres with the knobs yellow; wings with a light brown tinge; male hypopygium with the dorsal lobe of the basistyle very small, fleshy; mesal lobe triangularly produced, the apex a short acute spine; outer dististyle simple, the inner style with short lateral spines.

Male.—Length about 3·6 mm.; wing 4·6 mm.

Rostrum and palpi black. Antennæ of moderate length, if bent backward extending about to the wing-root, dark brown throughout; flagellar segments with a dense erect pale pubescence and long, unilaterally arranged, black setæ. Head dark brown.

Pronotum dark brown. Lateral pretergites brownish testaceous, very indistinct. Mesonotum dark brown, the humeral region of the præscutum vaguely brighter; pseudosutural foveæ dark; præscutal interspaces with long pale setæ. Pleura dark brown. Halteres with the base of the stem and the knobs light yellow, the central portion of the stem dusky. Legs with the coxæ and trochanters testaceous-yellow; femora brownish testaceous; remainder of legs broken. Wings with a light brown tinge, the veins slightly darker brown; macrotrichiæ dark brown. Venation: *r* lying a short distance beyond the level of *r–m*; vein *2nd A* ending just beyond the level of the caudal end of *m–cu*, the course of the anal veins generally parallel.

Abdomen dark brown, the hypopygium only a trifle brighter. Male hypopygium with the dorsal lobe of the basistyle very small, obtuse, and not chitinized; ventral lobe clavate, pale, the mesal face with erect to retrorse setæ and abundant setulæ; mesal lobe conspicuously developed, the mesal face densely setiferous, the apex triangularly produced, terminating in a small, acute, black spine. Outer dististyle a simple rod, the basal half paler and slightly more dilated, the distal half narrowed into a slender black spine that is angularly bent near mid-length, thence running out into a straight acute point. Inner dististyle shorter, appearing as a flattened blade that bears a flattened spine on the outer margin near mid-length, and a pale tooth-like spine on the inner face just before the gently curved apex; outer margin of style between the lateral spine and apex with three or four appressed spinulæ. Ædeagus relatively long and slender, tapering gradually to the very slender apex. Ninth sternite relatively broad, the lateral angles rectangularly rounded.

Hab. Tasmania.

Holotype, ♂, Hartz Mts., December 9, 1922 (*A. Tonnoir*).

Molophilus suavis, sp. n.

Belongs to the *gracilis* group and subgroup; antennæ short; male hypopygium with the dorsal lobe of basistyle produced into an acute curved spine; inner dististyle simple, the outer bifid; ædeagus long and slender.

Male.—Length about 3 mm.; wing 4·5–4·8 mm.

Female.—Length about 4 mm.; wing 5 mm.

Rostrum and palpi brown, the latter darker. Antennæ short, if bent backward scarcely attaining the wing-root; basal segments obscure yellow to brownish yellow; flagellar segments short-oval, brownish testaceous, the terminal segments passing into darker. Head dark brown.

Pronotum obscure yellow. Lateral pretergites narrowly sulphur-yellow. Mesonotal præscutum with three confluent sub-shiny dark brown stripes that virtually cover the sclerite, the humeral triangles yellow, in some individuals the colour continued back along the margin to the wing-root; remainder of mesonotum dark brown. Pleura dark brown, indistinctly striped longitudinally with obscure brownish yellow, the latter including the dorsal portions of the sternopleurite; wing-base conspicuously light yellow. Halteres pale, the knobs obscure yellow, the stem clothed with appressed, somewhat darker setæ. Legs long and slender; coxæ brownish testaceous; trochanters obscure yellow; femora brownish yellow to pale yellowish brown, the tips passing into darker; ground-colour of the remainder of the femur nearly hidden by dark setæ; tibiæ and tarsi dark brown; fore tarsi longer than either the femur or tibia; middle and hind tarsi shorter than their respective tibiæ. Wings tinged with yellow, the veins slightly darker yellow; macrotrichiæ brown; a patch of darker trichiæ on *r–m*. Venation: vein *2nd A* ending a short distance beyond the cephalic end of *m–cu*.

Abdomen brown, the hypopygium paler yellowish brown. Male hypopygium with the basistyle trifid, as in the group; dorsal lobe short, the apex produced caudad into a long, gently curved, black spine, the spines of the two sides almost contiguous or decussate on the median line; ventral lobe longest, obtusely rounded at apex, the outer face with scattered elongate setæ, the mesal face and apex with dense delicate setæ; mesal lobe flattened, the apex obtuse, the margin with a fringe of delicate setulæ, the disk with larger setæ; viewed dorsally, only the narrow edge of this lobe is visible, but in microscopic slides the lobe becomes flattened and its true dimensions shown. Outer dististyle bifid, the two arms blackened, separated from one another by a rounded notch. Inner dististyle a gently curved black spine that narrows gradually to the acute black tip. Ædeagus long and slender. Ovipositor with the tergal valves unusually strongly upcurved, the tips acute, the margins smooth.

Hab. Tasmania.

Holotype, ♂, Cradle Valley, altitude 3500 feet, January 11, 1923 (*A. Tonnoir*).

Allotopotype, ♀, January 26, 1923 (*A. Tonnoir*).

Paratopotypes, 6 ♂♂, January 10–12, January 27, 1923; *paratypes*, 2 ♂♂, Adventure Bay, December 31, 1922 (*A. Tonnoir*).

Molophilus tenuiclavus, sp. n.

Belongs to the *gracilis* group and subgroup; male hypopygium with the dorsal angle of the basistyle a slender chitinized spine; ventral lobe a very slender pale club; only the outer dististyle acute at tip.

Male.—Length about 3·8 mm.; wing 4·4 mm.

Rostrum and palpi brownish black. Antennæ of moderate length, if bent backward extending about to the wing-root; scapal segments light brown; flagellum black, segments oval to long-oval, with a dense pale erect pubescence and moderately elongate unilaterally arranged verticils. Head grey, the broad vertex more brownish grey, the occipital region more yellowish.

Pronotum yellowish brown. Lateral pretergites narrowly pale yellow. Mesonotal præscutum light brown with two narrow dark brown stripes that are separated from one another by a somewhat narrower line of the ground-colour; scutum brown, the median area broadly more greyish; scutellum pale ochreous; postnotum dark brown. Pleura dark brown, the sternopleurite a trifle paler. Halteres pale yellow. Legs with the coxæ pale brown; trochanters brownish yellow; femora brown, the bases more yellowish, the tips passing into brown; tibiæ brown, fore tibia (♂) with a very conspicuous but concolorous dilated ring; tarsi brown, the terminal segments brownish black. Wings with a greyish tinge, the base slightly more yellow; veins dark brown, the macrotrichiæ even darker; indistinct darker clouds at the cord. Venation: *r* lying slightly proximad of *r–m*; vein *2nd A* moderately elongate, ending just beyond the level of the origin of the petiole of cell M_3.

Abdomen dark brown, the hypopygium a trifle paler. Male hypopygium with the basistyle large, the three lobes well-developed; dorsal lobe narrowed into a slender chitinized spine; ventral lobe unusually long and slender, appearing as a narrow club, the surface with abundant setulæ and a few setæ, those on the mesal face retrorse, the setæ confined to the distal third of the lobe; mesal lobe broad and flattened. Outer dististyle chitinized, terminating in a sinuous black spine, near mid-length on outer face with a flattened wing. Inner dististyle shorter, a flattened pale blade, the apex terminating in a small dusky knob, the outer margin with abundant microscropic spinulæ that become more numerous at the apex; inner margin before the apex dilated into a flange, with microscopic spinulæ. Ædeagus relatively long, the distal fourth narrowed.

Hab. New South Wales.

Holotype, ♂, Narara, November 3, 1921 (*A. Tonnoir*).

Molophilus æquistylus, sp. n.

Belongs to the *gracilis* group and subgroup; general coloration dark brown, the scutellum brightened; halteres yellow; wings with a pale brown tinge, the base narrowly yellowish; abdomen dark brown, the hypopygium paler; male hypopygium with the dististyles simple, approximately equal to one another in size and shape.

Male.—Length 3·8–4 mm.; wing 4·8 mm.

Female.—Length about 4·5 mm.; wing about 6 mm.

Rostrum and palpi black. Antennæ black throughout, of moderate length, in the male, if bent backward, extending about to the wing-root; flagellar segments oval with a dense whitish pubescence and relatively short, unilaterally arranged verticils. Head dark brownish grey.

Pronotum light yellow, the median area infuscated. Anterior lateral pretergites light sulphur-yellow, the posterior pretergites more obscure. Mesonotum dark brown, the pseudosutural foveæ shiny black; humeral region of præscutum restrictedly brightened; posterior lateral angles of the scutal lobes obscure reddish yellow; scutellum yellowish to obscure ochreous. Pleura dark brownish grey, the dorsopleural membrane dark. Halteres yellow, the knobs brighter. Legs with the coxæ and trochanters obscure yellow, the fore coxæ darker; femora brown, the bases paler; tibiæ and tarsi brownish black. Wings with a pale brownish tinge, the base narrowly yellow; veins and macrotrichiæ darker brown; stigmal region narrowly darkened. Venation: *r* some distance beyond the level of *r–m*, the basal section of R_{2+3} being fully twice R_{4+5}; vein *2nd A* relatively short, ending about opposite the caudal end of *m–cu*.

Abdomen dark brown, the hypopygium paler. Male hypopygium with the dorsal and ventral lobes of the basistyle relatively slender, the dorsal lobe a straight needle-like spine, the ventral lobe clavate, slender, the head slightly dilated and provided with retrorse setæ. The dististyles are generally similar to one another in shape and size, appearing as simple unbranched rods, the apex of each bent into a small curved point or spine, the outer style more obtuse at apex. Ædeagus relatively elongate, longer than the dististyles. Ninth sternite broad, the lateral angles rectangular, produced into small tubercles, these angles glabrous, the caudo-median area of the tergite a little convex and with numerous small setæ. Ovipositor with the bases of the valves blackened, the tergal valves light yellow.

Hab. Victoria, Tasmania.

Holotype, ♂, Burnie, Tasmania, October 27, 1922 (*A. Tonnoir*).

Allotopotype, ♀, October 25, 1922.

Paratopotypes, 1 ♂, 1 ♀, January 11–31, 1923 (*A. Tonnoir*); *paratypes*, ♂, National Park, Tasmania, December 16, 1922 (*A. Tonnoir*); ♀, Hobart, Tasmania, January

3, 1923 (*A. Tonnoir*); ♂, Lower Tarwin, Victoria, November 22, 1925 (*G. F. Hill*), in the National Museum of Victoria.

Molophilus setulistylus, sp. n.

Belongs to the *gracilis* group and subgroup; general coloration dark brown, the pleura more pruinose; scutellum obscure yellow; male hypopygium with the dorsal lobe of the basistyle a long slender spine; dististyles approximately equal in length and general shape, the outer slightly broader, its disk with abundant microscopic setulæ.

Male.—Length abont 3·8–4 mm.; wing 5·4 mm.

Female.—Length about 5–5·3 mm.; wing 5·5–6·3 mm.

Rostrum and palpi black. Antennæ of moderate length, if bent backward scarcely attaining the wing-root, the scapal segments reddish brown, the flagellum black; flagellar segments oval, the verticils and white pubescence conspicuous. Head grey.

Pronotum yellow above, the sides abruptly dark brown. Lateral pretergites restrictedly clear sulphur-yellow, sometimes interrupted behind the pseudosutural foveæ. Mesonotum dark brown, the median area of the præscutum a trifle darker than the sides; pseudosutural foveæ black; humeral regions of præscutum very restrictedly obscure yellow, the lateral margins pruinose; scutum dark brown, the posterior lateral callosities obscure yellowish; scutellum obscure yellow, darker basally; postnotum dark greyish brown. Pleura concolorous with the postnotum. Halteres with the stem pale, the knobs light yellow. Legs with the coxæ and trochanters reddish brown; remainder of legs dark brownish black, the femoral bases narrowly paler; fore tibial ring (♂) dilated, but scarcely darker than the ground-colour. Wings with a dusky tinge, the veins and macrotrichiæ dark brown. Venation: vein *2nd A* relatively short, ending about opposite the caudal end of *m–cu*.

Abdomen dark greyish brown, with yellow setæ; hypopygium more reddish brown. Male hypopygium with the dorsal and ventral lobes of the basistyle well-developed, the mesal lobe less distinctly so; dorsal lobe a long slender black spine arising from the mesal apical angle of a small fleshy lobe; ventral lobe about as long as the dististyles, clavate, the mesal face with the usual retrorse to subretrorse setæ, these relatively slender and interspersed with more delicate setulæ; mesal lobe low, the apical portion narrowed into a cylindrical lobe that is directed laterad. Outer dististyle broader than the inner, the basal two-thirds expanded into a blade, the surface of which is provided with abundant microscopic setulæ, apical fourth of style narrowed into a stout gently curved black rod, the tip subacute. Inner dististyle of approximately the same length as the outer, but more slender, the base a little expanded, the apical fourth of the style narrowed into a straight acute black spine. Ædeagus longer than the dististyle.

Hab. New South Wales.

Holotype, ♂, Fish River, Blue Mts., March 25, 1923 (*E. W. Ferguson*); No. 78.

Allotopotype, ♀.

Paratopotype, ♂; *paratypes*, 1 ♂, 1 ♀, Blackheath, Blue Mts., altitude 3500 feet, April 1, 1922 (*E. W. Ferguson*).

M. setulistylus is most closely related to the more southern *M. æquistylus*, sp. n., differing in the broader outer dististyle with abundant setulæ on its disk.

Molophilus scaber, sp. n.

Belongs to the *gracilis* group and subgroup; general coloration brownish black, the humeral region of the præscutum, knobs of the halteres, and the coxæ brighter; male hypopygium with the mesal lobe of the basistyle produced into a small needle-like spine; inner dististyle sinuous, the apex beneath microscopically roughened and conspicuously setiferous.

Male.—Length about 3·5–4·2 mm.; wing 4·6–5·8 mm.

Female.—Length about 4 mm.; wing about 4·5 mm.

Rostrum and palpi brownish black. Antennæ of moderate length, in the male, if bent backward, extending to some distance beyond the wing-root; basal segments brownish testaceous, the remaining segments uniformly dark brown, with conspicuous black setæ and verticils. Head black.

Pronotum dusky above, obscure yellow laterally. Anterior lateral pretergites sulphur-yellow. Mesonotum shiny brownish black, the humeral region of the præscutum shiny fulvous-yellow, the colour extended backward along the lateral margin almost to the wing-root, becoming narrower and more infuscated behind. In the allotype female, the whole præscutum is of a paler brown than the remainder of the body. Pleura black. Halteres pale brown, the base of the stem paler, the knobs light yellow. Legs with the coxæ and trochanters testaceous-yellow; femora brown, densely covered with appressed black setæ; remainder of legs dark brown ; no evident tibial ring in the male. Wings with a strong dusky tinge, the veins darker brown ; macrotrichiæ black, a few in the stigmal region and on the petiole of cell M_3 more yellowish. Venation : vein *2nd A* ending shortly beyond the origin of the petiole of cell M_3.

Abdomen brownish black, including the hypopygium. Male hypopygium with the basistyles relatively large, the ventral lobe very long and slender, approximately as long as the longest dististyle, the mesal face with delicate erect to retrorse setæ; outer face of style with fewer long coarse setæ; mesal lobe extensively flattened, obtusely rounded, its ventral portion produced caudad into a long, very slender, sinuous, black spine, the basal half a little dilated, thence prolonged into a needle-like point. Both dististyles arise close together at the base of the ventral lobe of the basistyle. Outer dististyle chitinized nearly to the base, long and slender, the arms unequal, the outer arm much longer than the short, thumb-like, mesal arm ; mesal face of style near base with a spinous projection. Inner or basal dististyle a little longer than the outer, entirely blackened, appearing as a slender sinuous rod, cylindrical, the apex a little dilated into a spear-like head ; upper or outer surface of this head with long setæ, the lower surface with about ten to twelve roughened teeth and numerous short setæ. Ædeagus relatively long and slender, narrowed to the tip, approximately as long as the inner dististyle. Ovipositor with the valves very long and slender, the tergal valves yellowish horn-colour.

Hab. New South Wales.

Holotype, ♂, Blackheath, Blue Mts., altitude 3500 feet, April 13, 1922 (*E. W. Ferguson*) ; No. 79.

Allotype, ♀, French's Forest, near Sydney, July 15, 1923 (*I. M. Mackerras*).

Dr. Ferguson and Dr. Mackerras both note that the present is "very close to *M. helmsi*, Skuse, but the dististyles longer and more slender."

Molophilus tripectinatus, sp. n.

Belongs to the *gracilis* group and subgroup ; general coloration dark brown, the scutellum slightly tinged with yellow; wings with a faint brownish tinge; male hypopygium with the outer dististyle profoundly bifid, the outer arm expanded into a pale fan-like lobe; inner dististyle a clavate lobe, before the apex with three heavily blackened teeth.

Male.—Length about 3·2 mm.; wing 4·5 mm.

Rostrum and palpi brownish black. Antennal scape dark brown, the flagellum broken. Head dark brown, grey pruinose.

Pronotum dark brown medially, light yellow laterally. Lateral pretergites light sulphur-yellow. Mesonotum dark brown, the præscutal region a little brighter; scutellum with a slight yellowish tinge. Pleura dark brown. Halteres with the stem dusky, the knobs obscure yellow. Legs with the coxæ and trochanters brownish yellow; remainder of the legs dark brown, the femoral bases broadly yellowish; front legs broken. Wings with a faint brownish tinge, the veins and macrotrichiæ darker brown. Venation: vein *2nd A* of moderate length, ending a short distance beyond the origin of the petiole of cell M_3.

Abdomen dark brown. Male hypopygium with the basistyles relatively large, the lobes short; mesal lobe very broad, the ventral apical angle produced into a small obtuse fleshy lobe; ventral lobe relatively slender, the mesal face on apical third with numerous coarse erect to feebly retrorse setæ; no distinct dorsal lobe. Dististyles appearing nearly apical in position, due to the shortness of the lobes of the basistyle; outer style divided almost to its base, the outer arm expanded into a broad pale flattened fan-like lobe, the inner arm a stout blackened lobe, the apex obtuse. Inner dististyle a little longer, slightly dilated outwardly, the inner apical angle a trifle produced; before the apex on the mesal face with a small black plate bearing three subequal black teeth; lateral region of the style with conspicuous appressed silken setæ. Ædeagus relatively long and slender, about one-half longer than the longest dististyle.

Hab. New South Wales.

Holotype, ♂, Sydney, September 16, 1923 (*E. W. Ferguson*); No. 70.

Molophilus tristylus, sp. n.

Belongs to the *gracilis* group and subgroup; general coloration dark grey, the scutellum yellowish; male hypopygium with the outer dististyle divided to the very base, so there appear to be three dististyles; ventral lobe of the basistyle with an acute spine on mesal face.

Male.—Length about 3 mm.; wing 4·5 mm.

Rostrum and palpi black. Antennæ of moderate length, if bent backward extending to shortly beyond the wing-root, dark brown throughout; flagellar segments oval, with a long, conspicuous, white pubescence; verticils elongate. Head light grey.

Pronotum obscure brownish yellow, darker laterally. Lateral pretergites light yellow. Mesonotal præscutum brown, the lateral margins clear grey; pseudosutural foveæ dark brown; scutum grey; the lobes more infuscated; scutellum conspicuously yellowish; postnotum grey. Pleura dark grey. Halteres pale, the knobs dark brown. Legs with the coxæ and trochanters reddish; femora brown with the bases a little paler; tibiæ brown, the tips blackened; fore tibia (♂) with a conspicuous dilated black ring; tarsi black. Wings with a yellowish tinge, the veins yellowish brown, the macrotrichiæ brown. Venation: vein *2nd A* ending just beyond the base of the petiole of cell M_3.

Abdomen dark brown, heavily grey pruinose; hypopygium dark reddish brown. Male hypopygium with the basistyle complicated in structure, with four short lobes; ventral lobe relatively short, clavate, the mesal margin before the apex with a conspicuous spine that is directed basad, the face of the style with additional setæ that are erect and subretrorse; dorsal lobe shorter, subacute, weakly chitinized; mesal lobes two, both fleshy, one very extensive, the second more conically produced and with large conspicuous setæ. Dististyles two, but the outer one so deeply divided that there appear to be three; outer dististyle divided to the very base, the arms divergent, one directed ventrad, irregularly split at apex, the arms complicated, the outer more slender, strongly recurved near mid-length, the inner arm blackened, flattened, the surface somewhat fluted; dorsal arm of the outer dististyle a simple sinuous rod, a little enlarged just beyond mid-length, thence narrowed to the acute blackened tip. Basal or inner dististyle a simple chitinized rod, the basal two-thirds straight, the distal third gently curved to the acute blackened tip, before the apex on the outer face with several appressed spinulæ. Ædeagus longer than the basal dististyle.

Hab. New South Wales.

Holotype, ♂, Bulli, August 25, 1923 (*E. W. Ferguson*); No. 75.

Paratopotype, ♂.

Molophilus mjöbergi, sp. n.

Belongs to the *gracilis* group, *ruficollis* subgroup; general coloration pale yellowish brown, the pronotum and humeri brighter yellow; legs brownish black; male hypopygium with the basistyles very short and stout, the dististyles unusually long and slender, the inner entirely blackened, simple, sinuous to the acute apex.

Male.—Length about 2·8 mm.; wing 3·4 mm.

Rostrum and palpi dark brown. Antennæ moderately long, if bent backward extending to slightly beyond the wing-root, the scapal segments yellowish testaceous, the flagellar segments dark brown, elongate-oval, with a long pale erect pubescence, in addition to the conspicuous verticils. Head discoloured in the unique type, apparently dark-coloured.

Pronotum and humeral region of the præscutum light yellow, the remainder of the mesonotal præscutum light yellowish brown, without markings; scutellum and posterior lateral region of the scutum a little darker; lateral pretergites a trifle brighter yellow than the pronotum. Pleura reddish yellow. Halteres orange-yellow. Legs with the coxæ and trochanters yellowish testaceous; remainder of the legs brownish black; fore legs broken. Wings with a slight greyish tinge, the basal and costal portions more yellowish; veins slightly darker than the ground-colour; macrotrichiæ dark brown, conspicuous, grouped along the cord to form an indistinct cross-band of dark hairs. Venation: vein *2nd A* relatively short, ending about opposite the posterior end of the oblique *m–cu.*

Abdomen brown, the hypopygium more yellowish. Male hypopygium with the basistyles very short and stout, much broader than long, the ventral lobe best developed, setiferous, the usual retrorse setæ relatively large and coarse; mesal lobe small, feebly chitinized; dorsal lobe not developed. Dististyles very long and slender, the outer style entirely pale, the extreme base a little enlarged, the stem arcuated, very slender, the apex expanded into a bifid blade, the outer arm largest, nearly hyaline. Inner dististyle even longer than the outer, appearing as an entirely blackened, simple, flattened, strongly sinuous, ribbon-like blade, the apex acute. Ædeagus shorter than the inner dististyle.

Hab. N. Queensland.

Holotype, ♂, Malanda, altitude 2400 feet (*Eric Mjöberg*); No. 100.

Type in the collection of the Riksmuseets, Stockholm. This interesting fly is named in honour of Dr. Eric Mjöberg, who has added much to our knowledge of the Tipulidæ of Australia and Borneo.

Molophilus prælatus, sp. n.

Belongs to the *gracilis* group, *ruficollis* subgroup; size large (wing, ♂. 6·5 mm.); general coloration pale reddish brown; wings yellowish; male hypopygium with the outer dististyle sickle-shaped, the lateral margin with about fifteen appressed spinulæ; gonapophyses forming a median chitinized structure that terminates in two divaricate hooks.

Male.—Length about 5 mm.; wing 6·5 mm.

Rostrum and palpi brown. Antennæ relatively short, brown throughout, the flagellar segments subcylindrical, with dense black setæ. Head brown, the anterior vertex obscure fulvous, the posterior vertex with numerous yellow and a few stouter black setæ.

Lateral pretergites testaceous-yellow. Mesonotal præscutum obscure reddish brown, the humeral region vaguely paler; lateral præscutal stripes very vaguely indicated; remainder of the mesonotum reddish brown, the centres of the scutal lobes darker. Pleura pale brownish testaceous, immaculate. Halteres pale, the knobs of the unique type destroyed by Psocids. Legs with the coxæ brownish testaceous; trochanters more yellowish; remainder of the legs obscure yellow, with appressed brown setæ that tend to obscure the ground-colour, especially of the femora; terminal tarsal segments infuscated; no dilated ring on fore tibia of the male: fore femora shorter than the tibiæ, but the middle femora slightly exceeding the tibiæ. Wings with a strong yellowish tinge, the veins darker yellow. Venation: *m–cu* shortly beyond the fork of *M*; vein *2nd A* elongate, strongly arcuated, ending near mid-length of the petiole of cell M_3.

Abdomen dark brown, the hypopygium more yellowish. Male hypopygium short and compact. Basistyles with the ventral lobe relatively short and stout, the apex obtusely rounded, the mesal face with long, dense, yellow setæ; dorsal and mesal lobes of basistyle short and obtuse, but indicated. Outer dististyle a powerful black sickle-shaped rod, the base enlarged, the stem strongly curved to the long black apical spine, the lateral margin with about fifteen small appressed spinulæ. Inner dististyle of approximately the same length as the outer, but more slender basally and bent in the opposite direction, the apex a strongly curved hook-like spine, separated by a small circular notch from a flange-like expansion on the inner face of the style. Ædeagus relatively short, about as long as the dististyles, slender, the basal two-thirds subtended by a pale wing on either side.

What would appear from its position to represent gonapophyses is a heavily blackened median structure, the base broadest, narrowed to the apex which terminates in two powerful divaricate hooks, directed laterad, the apical notch thus formed V-shaped, provided with a few small setæ.

Hab. New South Wales.

Holotype, ♂, Blackheath, Blue Mts., altitude 3500 feet, January 26, 1922 (*E. W. Ferguson*) ; No. 66.

VI.—*The Systematic Position of some Genera of Copepoda-Harpacticoida endemic in Southern Russia.* By E. W. Borutzky (Moscow).

(Laboratory of the Biological Station of Kossino.)

Schmankevitsch, in his work, "Some Crustacea of Salt- and Fresh-water Lakes, and their Relation to the Surrounding Environment" (in Russian), which appeared in 1875, in the 'Memoirs of the Novorossiisk Society of Naturalists' (vol. iii.), described five representatives of the Harpacticoida, which he found in the Odessa liman (lagunes) :—

1. *Cletocamptus retrogressus*, sp. n.
2. —— *strömii* (Lilljeborg).
3. *Transfuga salinus*, sp. n.
4. —— *lacustris*, sp. n.
5. *Dactylopus inuber*, sp. n.

None of these species have been found anywhere else since, and they thus seem to be forms endemic for the salt lakes of Southern Russia.

On attentively studying the descriptions of these endemic species, and on comparing them with those of other species found afterwards in the salt lakes, I came to the conclusion that nearly all the species of Schmankevitsch have been, later on, described as new forms by other authors.

Cletocamptus retrogressus, Schmankevitsch.

1875. *Cletocamptus retrogressus*, Schmankevitsch, "Some Crustacea of Salt- and Fresh-water Lakes, and their Relation to the Surrounding Environment," Memoirs of the Novorossiisk Society of Naturalists, vol. iii. (in Russian).

1883. *Canthocamptus brevicornis*, Daday. "Monographia Eucopepodorum liberorum in Hungaria hucusque repertorum," Math. és Term.-tud. Közlemények. xix.

1889. *Mesochra blanchardi*, Richard, "Description du *Mesochra blanchardi*, Copépode nouveau des Sebkhas algériennes," Bull. Soc. Zool. de France, xiv.

1894. *Wolterstorffia blanchardi*, Schmeil, "Einige neue Harpacticidenformen des Susswassers," Zeitschr. Naturwissenschaft. Halle, Bd. lxvii.
1900. *Canthocamptus ophiocamptoides*, Lepechkine, "Sur la faune des Copépodes de la province d'Akmolinsk," Mém. de la Soc. Impér. des amateurs des Sc. Natur. d'Anthropologie et d'Ethnographie, lii. c. 2 (en russe).
1903. *Marshia blanchardi*, G. O. Sars, "On the Crustacean Fauna of Central Asia.—Part III. Copepoda and Ostracoda," Annuaire de Musée zoologique de l'Acad. Imp. des Sciences de St. Pétersbourg, tome viii.
1905. *Wolterstorffia blanchardi*, van Douwe, "Copepoden von Transkaukasien, Transcaspien und Turkestan," Zool. Jahrb. Abt. für Syst. Bd. xxii.
1923. *Wolterstorffia brevicornis*, Chappuis, "Sur la validité spécifique de deux Harpacticides," Bull. de la Soc. des Sc. de Cluj (Roumania), t. ii. part 2.

In 1889, Richard described a new form of Copepoda from the salt lakes of Algiers, and named it *Mesochra blanchardi*. Schmeil, in 1894, discovered a new species in the salt lakes of Holstem, which he named *Wolterstorffia confluens*, creating a new genus, in which he also included the form described by Richard. In 1900, Lepechkine, when investigating the fauna of the lakes of Akmolinsk, found a form of Copepoda in the Tengis lake, and called it *Canthocamptus ophiocamptoides*. However, Sars, when working in 1903 on the materials from the same parts of Turkestan, pointed out that the species of Lepechkine is identical with *Wolterstorffia blanchardi*. In his turn he accepted for the European representatives the generic name of *Marshia*, established by Herrick for the species of Northern America. Sars supposed that Herrick had, by mistake, described the inner ramus of the swimming-legs instead of the outer, and *vice versa*, and on this account united the two genera into one, establishing the priority of Herrick. Two years later, van Douwe, showing the mistake of Sars, maintained the priority of the generic name *Wolterstorffia* given by Schmeil. The representatives of the genus figured under the latter name up to 1923, when Chappuis, doubtful as to the endemism of some of the species described by Daday in his monograph, "Harpacticidæ Hungariæ," studied them in detail, and came to the conclusion that most of the endemic forms had either already been described earlier, or else had been discovered later and described under another name. To the latter number belongs *Canthocamptus brevicornis*, Daday, which is certainly identical with *Wolterstorffia blanchardi*. Chappuis likewise established the priority of Daday to the specific name *Wolterstorffia brevicornis* (Daday).

In 1875 Schmankevitsch, in the work already mentioned, gives the description of a new genus and species, *Cletocamptus retrogressus*. On examining his description and drawings, and on comparing them with the description of Richard and those of other authors who mention *Wolterstorffia blanchardi*, I came to the conclusion that this species is identical with *Cletocamptus retrogressus*.

The description of Schmankevitsch is of seven pages with a great many illustrations (pp. 111–118, tab. ii. figs. 7–16, tab. iii. figs. 3–8, tab. iv. fig. 3), representing nearly all the extremities and the furca. It is true that the figures are not quite accurate, owing to the lack of certain details, but these are not of essential importance. As to the generic and specific characters, they are well represented.

Cletocamptus retrogressus, Schmankevitsch.	*Mesochra blanchardi*, Richard.
♀. "The antennæ of the first pair consists of six joints, besides the basilar piece (insertion joint). On the extending angle of the 4th joint there is a cuticular appendage which only almost reaches the end of the antenna, or does not quite reach this extremity" *.	"Les antennes de la 1re paire (fig. 1) sont composées, outre un article d'insertion difficile à voir, de 6 articles . . . Le 4me porte un organe sensible à l'extrémité arrondie, dépassant l'extrémité de l'antenne."

It can be seen from a comparison of the descriptions and the figures that the antennæ i. are completely alike. The length of the sensorial cylinder on the fourth joint, according to the description of Sars, does not surpass, or attains, the end of the seta; on Sars's figure this appendage extends far beyond the end of the antennæ. On specimens from the Aral sea and the Elton lake the sensorial cylinder extends likewise beyond the antenna's end, but not so far as on Sars's drawing. Evidently this character is one that easily varies under the influence of different degrees of salinity.

Cletocamptus retrogressus, Schmankevitsch.	*Mesochra blanchardi*, Richard.
"The antennæ of the second pair do not present anything particular. The appendage of these antennæ is small and thin, ending in two setæ, a long and a short one (tab. ii. fig. 10). It is somewhat indistinctly divided into two joints . . . At the end of the first one there is a rather long seta, and opposite to it, on the other side, two very small ones."	"Les antennes de la 2me paire ont 2 branches . . . La 2e branche de l'antenne est inarticulée; son extrémité porte une soie ciliée ; il y en a une semblable au milieu du bord supérieur. L'extrémité de cette branche porte encore 2 poils courts."

A comparison with the figure given by Sars shows an almost complete analogy, except in some insignificant details, such as the disposition of the setæ. Both Sars and Schmankevitsch point out an indistinct division of the appendage into two joints, whilst Richard erroneously describes it as being one-jointed.

---

* All the quotations of the diagnoses of Schmankevitsch are translated literally into English.

> "The oral parts are quite like those of *Canthocamptus staphylinus*, Cls. (tab. ii. figs. 12, 13, 14) . . . The mandible is rather broad and short (tab. ii. fig. 11). Its appendage is two-jointed. At its end are two setæ of unequal length, and there is a seta at the end of the first joint (on its side), before the division."

> "La mandibule est garnie de 4 dents: une 1^{re} simple, plus forte que les autres; la 2^{de} est aussi simple, les 2 dernières sont divisées en dents secondaires, enfin suivent 2 soies recourbées. Le palpe uniarticulé porte 2 soies inégales et simples."

Here, also, as in the case of the structure of the antennæ ii., we encounter a difference of opinion as to the joints, and it seems probable that here again Richard has made a mistake. It is to be regretted that Sars has not described the organs of the mouth, nor given any figures.

I will not transcribe literally the descriptions of the swimming-legs as given by different authors. Schmankevitsch has made a detailed analysis of them in four pages, completing it by good drawings. I will only point out the differences ascertained on comparing the descriptions of Richard and Sars. The system of joints of the inner as well as of the outer branches is completely similar, so are likewise their mutual proportions as to length, the only difference here being again that of minor details.

First Pair of Swimming-legs.—Schmankevitsch figures four setæ on the terminal joint of the outer ramus. On Sars's drawing there are distinctly three. On examining the descriptions and the figures of other authors, as well as the specimens from the Elton lake in my possession, I was obliged to admit that in this case Sars had been mistaken. On all the Elton specimens, and also on the drawings of the different authors, there are four of these setæ. The one missing on Sars's drawing is very minute and transparent, and could easily escape the author's attention. On the other hand, Schmankevitsch does not represent the seta on the external side of the second joint, which is figured by the other investigators and is found on the Lake Elton specimens.

Second and Third Pair of Legs.—In their structure some points of difference with the drawings of Sars can also be shown. The inner branches being completely identical, the structure of the exterior ones seems, as it were, to be confused. The outer branch of the second pair of legs in Sars's figure corresponds to the exopodite of the third pair of Schmankevitsch, and *vice versa*. According to the structure of these legs, the specimens from Algiers and from Lake Elton are absolutely identical to those of Odessa. This probably shows that in the given case also Sars has made a mistake; this seems all the more likely as Sars gives, besides the figures of the extremities in the female, those of the extremities in the male, and that the structure of their external branches presents an inverse relation—viz., the same as in *Cletocamptus retrogressus*.

The fourth pair of legs is quite the same as that figured by other authors.

On comparing the drawings of the inner branch of the third pair of legs in the male, one is convinced that by their structure they correspond perfectly to the figure of Sars. Schmankevitsch has mistakenly represented the endopodites as being two-jointed, for the position of the lateral spine on the last joint does not leave any doubt as to its being three-jointed. As to the limit between the second and third joints, which is usually very indistinct, Schmankevitsch has overlooked it.

> "The fifth rudimentary pair of legs (tab. iv. fig. 3) consists each of a bifurcated plate, bearing six setæ on each of the two branches. One of the middle setæ is considerably longer than the others, on each branch. The most external of the setæ, on the exterior branch, is separated from the neighbouring seta by an indentation, so that it is situated on a short and thin separate branchlet."

> "Les pattes de la 5e paire (fig. 7) sont formées d'un article basilaire dont le bord interne rectiligne est cilié, et porte à son extrémité 6 soies, dont les 4 internes sont ciliées, l'externe étant la plus petite; et d'un 2e article indistinctement séparé du basal et portant 5 soies, dont une beaucoup plus grande que les autres, l'externe seule n'étant pas ciliée."

Schmankevitsch, in minutely describing the structure of the small rudimentary leg, does not mention at all the presence of cilia on the inside and outside angles of the interior branch; in all other respects the structure is quite like that of *Mesochra blanchardi*. As to Richard, he points out erroneously that the rudimentary leg is two-jointed.

The structure of the furcal joints agrees perfectly with the descriptions of all the investigators.

We come, then, to the following conclusion: the description of *Cletocamptus retrogressus* is quite sufficient in order establish the identity of this form with *Mesochra blanchardi* (=*Wolterstorffia blanchardi*). Schmankevitsch having described his form fourteen years earlier than Richard, the priority in this case of the generic, as well as of the specific, name belongs to Schmankevitsch. In describing this species Schmankevitsch established a new genus, *Cletocamptus*, giving a brief Latin diagnosis of the genus itself, and also of the two species included in it, *Cletocamptus retrogressus* and *Cletocamptus strömii*, Lilljeborg. The latter species must be placed in the genus *Mesochra*.

Mesochra lilljeborgii, Boeck.

1875. *Cletocamptus stromii*, Schmankevitsch, "Some Crustacea of Salt- and Fresh-water Lakes" (in Russian).

Schmankevitsch identified the form he found in the Odessa limans (lagunes) with *Canthocamptus strömii*, Baird, pointed out that Lilljeborg's referring his form to Baird's species was inexact, and made out of this form a distinct species, which he placed in his newly-created genus *Cletocamptus*, leaving it its former specific name.

But in 1864 Boeck had already made of Lilljeborg's form an independent species, and established an independent genus for it: *Mesochra lilljeborgii.* Consequently, *Cletocamptus strömii* of Schmankevitsch must be considered as synonymous with *Mesochra lilljeborgii.*

Nitocra lacustris (Schmankevitsch).

1875. *Transfuga lacustris*, Schmankevitsch, "Some Crustacea of Salt- and Fresh-water Lakes, and their Relationship to the Surrounding Environment," Memoirs of the Novorossiisk Society of Naturalists, vol. iii. (in Russian.)
1889. *Canthocamptus treforti*, Daday, "Monographia Eucopepodorum liberorum in Hungaria hucusque repertorum," Math. ès Term.-tud Kozlemenyek. xix.
1891. *Canthocamptus yahiai*, Blanchard et Richard, "Faune des lacs salés d'Algérie," Mém. Soc. Zool. France, t. iv.
1905. *Nitocra muelleri*, Van Douwe, "Neue Susswasser-harpacticiden Deutschlands," Zool. Anz. xxviii. p. 433.
1894. *Nitocra simplex*, Schmeil, "Einige neue Harpacticidenformen des Susswassers," Zeitschr. Naturwissenschaft. Halle, Bd. lxvii.
1923. *Nitocra treforti*, Chappuis, "Sur la validité spécifique de deux Harpacticides," Bull. de la Société des Sc. de Cluj (Roumania), t. ii. part 2.

In 1923 Chappuis, in the article mentioned above, identifies the species *Canthocamptus treforti*, described by Daday (from the Hungarian salt-lakes), with *Nitocra simplex*, Schmeil, and establishes the priority of Daday as to the specific name. In the same notice Chappuis points out that *Nitocra simplex* is identical with *Canthocamptus yahiai* from the salt-lakes of Algiers, described by Blanchard and Richard. As to *Nitocra muelleri*, van Douve, the author himself showed later on that his form is identical with *Nitocra simplex*.

Besides the genus *Cletocamptus*, Schmankevitch created a second genus, *Transfuga*, in which he included two species, *Tr. salinus* and *Tr. lacustris*. The first of these species evidently belongs to the genus *Mesochra*, whilst the second is without doubt identical with *Nitocra simplex*, Schmeil. Here, also, the author minutely describes his form, giving a Latin diagnosis. Unhappily, there are no drawings; but Schmankevitsch constantly refers to the figures of *Cletocamptus retrogressus*, pointing out differences or analogies of structure between this or that extremity, thus presenting a perfectly distinct picture. Let us compare more accurately the descriptions of both authors :—

Transfuga lacustris, Schmankevitsch.	*Nitocra simplex*, Schmeil.
"The upper antennæ consist of eight joints, and, only by a little, do not reach the end of the first segment of the body. A cuticular appendage protrudes out of the angle of the fourth joint of the upper antenna, without much extending beyond the end of the joint. The appendage of the lower antennæ is short, bearing three setæ on a somewhat thickened extremity. It is one-jointed or divided in the middle, in a scarcely noticeable manner, into two joints."	"Vorderantennen achtgliedrig; die des Weibchens genau wie bei *N. hibernica*; die des Männchens ebenfalls schlank, vorletzter Segment derselben aber am Ausserrande mit perlartigen Cuticularverdickungen." Nebenast der Hinterantennen wie bei genannter Art.

Schmeil, in his description, makes comparison with *Nitocra hibernica*. On examining Schmeil's drawings of the latter species one can see almost complete analogy between these extremities in both species.

"The appendage of the upper mandible is two-jointed, small. The first joint is broad, with a strongly protruding outer angle at the end, on which there are three short and thin setæ; the second joint of the appendage is narrow, rather short, and with three setæ at the end" (tab. iii. fig. 2).	

There is no description of this appendage in Schmeil, but a study of the descriptions and drawings of other authors. as well as of the specimens from Lake Elton, convinces one of the existing likeness between the appendages. Only slight differences are noticeable, as to the number of setæ on the basilar joint. Schmankevitsch mentions three; on the Elton specimens I have observed two or three; on Richard's figures there are none at all. These discrepancies can be explained by the extreme fragility of the setæ undergoing microscopical preparation, and also by their extreme minuteness.

Concerning the structure of the other organs of the mouth, Schmankevitsch points out their analogy to those belonging to the other species he has described, in which these organs in their turn resemble those of the genus *Canthocamptus.* Schmeil does not say anything at all on the subject, but the resemblance of the genus *Nitocra* to the genus *Canthocamptus* shows that it belongs to the family of Canthocamptidæ.

"Both branches of the first pair of legs equal one another. The first joint of the inner branch is only twice as long as the second and third joints. Here, on the legs, no hinging joints are observed, or something like it is scarcely apparent on the second interval of the joints on this branch . . ."

"Innenäste aller Schwimmfusspaare dreigliedrig. Der des ersten Paares nur sehr wenig länger, als sein Aussenast; bei weiterem nicht in dem Masse zum Greiffusse umgebildet, als bei den anderen Arten. Das erste Segment desselben viel breiter und nur wenig länger als die beiden anderen, unter sich fast gleich langen Glieder."

I do not transcribe here word for word the descriptions of different authors on the number and disposition of the setæ—they concord completely. If we compare the system of the joints, the correlation in length of the joints, and the absence of hinging in them, we have to admit the complete similitude of the first swimming-legs.

Schmankevitsch does not give any detailed description of the remaining swimming-legs, recalling to mind their resemblance to the other species he has described: " . . . the second and third joints of these legs (viz., 2 and 3) are nearly the same in all respects as the entire two-jointed inner branch of the corresponding legs in *Transfuga salinus* and *Cletocamptus strömii. . . .*"

But both authors indicating that the inner branches are three-jointed, together with the similitude of the other extremities, may point to their probably being the same in both species, more so as the fifth leg scarcely presents any difference, as can be seen from the following description, translated literally:—

> "The rudimentary pair of legs is two-jointed, but the outer plate is divided by a deeper cut, is, as it were, drawn on the edges; it is narrower than the inner one, which it equals in length, or is somewhat longer. The inner plate has five unequal setæ on its rounded edge; the outer one has six unequal setæ on the same edge."

> "Fünfter Fuss des Weibchens: Innen partie des ersten Segmentes breit und nur etwa bis zur Mitte des zweiten Gliedes, reichend, Unterrand derselben abgerundet mit fünf Borsten . . . Das zweite Glied breit, nach dem Ende verschmälert, an der Spitze und dem letzten Drittel des Ausserrandes mit sechs Borsten von verschiedener Länge und Stärke."

In their main lines the descriptions coincide; it is true that in neither do the authors give any indications as to the spines at the end of the terminal joint and at the base of the lateral seta of the basilar joint, which are distinctly figured by Richard; but Schmankevitsch, in general, when describing his species, omitted certain minute details, dwelling circumstantially on the structure of the oral parts (particularly on the appendage of the mandibles) and of the swimming-legs, attributing to them a greater systematic significance.

Different investigators disagree, in a certain measure, about the disposition of the rows of spines on the abdomen-segments. Evidently we have to do here with a variability, depending from the different concentration of the salts in the water-basins, a circumstance which probably is not without its influence on the length of the sensorial cylinder and on that of the swimming-legs. As an example of this influence of concentration, one can quote the experiments of Schmankevitsch with the same species. He bred generations of these Copepoda in conditions of different salinity, and obtained a general diminution or augmentation of the creature's size, of its swimming-legs, of the character of the joints in antennæ i., etc. It is possible that the same changes as have been obtained experimentally take place in nature, in water-basins with different concentration of salts. Unhappily, as yet, the data we dispose of are too scanty, as the descriptions of the older investigators, where much is erroneous and inaccurate, cannot be taken as a basis, and later data are lacking completely, with the exception of remarks of a faunistic character.

Nitocra inuber (Schmankevitsch).

1875. *Dactylopus inuber*, Schmankevitsch, *l. c.*

1880. *Canthocamptus hibernicus*, Brady, "A Monograph of the Free

and Semi-parasitic Copepoda of the British Islands." Ray Society, London, Bd. ii. pp. 52–53. tab. xlvi. figs. 1–12.
1893. *Nitocra hibernica*, Schmeil, "Deutschlands freilebende Süsswasser Copepoden, II. Theil. Harpacticidæ," Bibliotheca Zoologica, pp. 78–84, Taf. vii. ff. 1–16.

Upon comparing the description of *Dactylopus inuber*, Schmankevitsch's mistake in placing this species in the genus *Dactylopus* becomes apparent, and also that this species is identical with *Nitocra hibernica*, Brady. The 8-jointed first antennæ, the structure of the palpus mandibulæ, the system of the joints and of the spines and setæ on the legs, similar to those of *Transfuga lacustris* (=*Nitocra simplex*), show indubitably that this form has been erroneously considered as belonging to the genus *Dactylopus*, and that it certainly belongs to the genus *Nitocra*. Schmankevitch himself points out that it does not present fully all the characters of the genus *Dactylopus*: by its characters, this species presents the highest degree of "development of *Cletocamptus strömii* (=*Mesochra lilljeborgii*). The transitional forms betweem them are *Transfuga salinus* and *Transfuga lacustris* (=*Nitocra simplex*), the first of them being nearer to *Cletocamptus strömii* and the second to *Dactylopus inuber*." The correlation in the length of the joints in the branches of the first pair of legs, the hinge-like joint of the endopodite, and also the presence of *Dactylopus inuber* in a fresh-water lake, all point to its identity with *Nitocra hibernica*.

VII.—*On the Occurrence of the Amphipod* Synurella ambulans *in Russia.* By E. Borutzky.

(Laboratory of the Kossino Biological Station, Moscow.)

This representative of the Amphipoda was found in great quantities in the springs of the government of Riazan by the expedition of the Kossino Biological Station, when investigating the lakes of the Mestschersky lowland.

For Russia, *Synurella ambulans* is here recorded for the first time, as until now it has only been known from Western Europe, where its habitat is either in ditches and cold springs or else in lake bottoms. I know of its having been found in the following localities:—(1) a ditch overgrown by *Lemna* and *Hydrocharis*, near Greifswald in

Germany (*F. Müller*, 1846 [*]) ; (2) ditches with stagnant waters in the environs of Warsaw ; a pond near the village of Bialopole (government of Lublin, district of Hrubieszow) (*Wrzesniowski*, 1879 [†]); later on *Synurella ambulans* was found also in Poland by Grokhowsky [‡] ; (3) lakes Wandlitz and Madü in Northern Germany ; (4) Montenegro, valley of the Krivi, in a small stream at an altitude of 1600 metres above the sea-level (*Mrázek*, 1906 [§]); (5) Moravia, near Brno (*S. Soudek*, 1920 [‡]); (6) Carinthia, in a cold-water spring near the Keutschacher See (*Adensamer*, 1925 [||]).

In the government of Riazan the habitat of *Synurella ambulans* is restricted to springs of a perfectly definite character. All these springs come out of the rather elevated sandy banks of lakes, formed along the course of the river Pra, affluent of the Oka (Lake Velikoé, near the village of Ouchmar; lake Lebedinoié, near the village of Mokeevo; river Pra, near village of Velikodvorié). From the sources of the springs, ditches lead to the lakes, the current in them is scarcely noticeable. On the very spot where the water issues out of the earth, there extends a hollow filled with water, reminding one somewhat of a water-hole ("botchag") with a sandy, rather slimy bottom, and a great quantity of decaying vegetable remains. Generally, alders grow round the spring, and their dense foliage overshadows the water-hole; the water is cold and transparent, either with no aquatic vegetation at all or else with overgrowths of *Lemna* and *Hydrocharis*. Such is the character of all the springs where *S. ambulans* has been discovered ; its exclusive habitat is in the water-holes, where it evidently finds favourable conditions of existence. In no springs of a different character, though tributary to the same lakes, nor in any of the lakes themselves, has *Synurella* ever been discovered, in spite of a careful investigation of the ditches (below the spring) leading from the spring, and of the littoral zone of the lakes. Consequently, in our region, *Synurella* is a typical dweller of the springs.

---

[*] Muller, Fr., "Ueber *Gammarus ambulans*, neue Art," Arch. f. Naturg. xii. (1846).

[†] Wrzesniowsky, A., "Ueber drei unterirdischen Gammariden, *Goplana polonica*, gen. et sp. n.," Zool. Anz. Jhrg. (1879).

[‡] Schäferna, Karel, "Amphipoda balcanica spola z posnámkami o jinyck sladkovodních Amphipodech," Vestnik kral. ceské Spolecnosti Nank. ii. (1922).

[§] Mrázek, A., "Wissenschaftliche Resultate einer zoologischen Reise nach Montenegro." Einleitung und Reisebericht. Vert. vir. ceske Spolec Nank. Praha (1903).

[||] Spandl, H., "Die Thierwelt der unterirdischen Gewässern," Speläologische Monographien, Bd. xi. (1926).

The character of the springs about Riazan, with a scarcely noticeable current, sometimes even with no current at all, where in summer the connection is broken up between the spring and the lake, owing to drought, gives one the impression that *S. ambulans* lives in standing water, but the water of the drying up ditches nevertheless remains sufficiently cool, owing to the slow but constant inflow of the water from the spring. It may be that Müller, Wrzesniowski, and Mrázek, when saying that *Synurella* is found in ditches with stagnant water, meant just such a kind of spring, drying up in summer. If this supposition is correct, it follows that *Synurella ambulans* is a water-spring form, dwelling in cold water, or a bottom lake form, belonging to lakes with a low temperature. Schäfferna's opinion is correct when he places *Synurella ambulans* in the cycle *Synurella–Boruta–Crangonyx*, the existing representatives of a large group, belonging to an ancient (perhaps Glacial) period, which died out with the advent of a warm period—those surviving migrating partly to the bottom of lakes with a low temperature, partly remaining on the surface of the earth in cold springs, or penetrating into subterranean waters, where they have produced blind forms (*Boruta tenebrarum*, *Crangonyx subterraneus*). *Boruta tenebrarum*, found by Wrzesniowski in a well at Zakopane in the Tatras in 1890 *, a blind form, presents some unimportant differences from *Synurella ambulans*, which points to the close relationship of both forms. It may well be that *Boruta tenebrarum* directly originated from *Synurella ambulans*, which form found unusual conditions in a well and lost the pigment of the eyes. The endemism of *Boruta tenebrarum* (found only once) and the pronounced tendency in *Synurella ambulans* towards a reduction of the eyes, formed only of several ommatidia, all speak in favour of this supposition. To a certain degree, it is corroborated by the following fact. The eyes of *Synurella ambulans*, out of different springs, present as well as great individual variability in the units from the same spring, also a good example of local variability between the specimens from different springs. As could be expected, in springs densely overgrown by alders and other vegetation, whose foliage covers the water-hole and prevents the daylight from penetrating completely, the pigmented eye of *Synurella ambulans* is less developed in the total number of units, and the quantity of ommatidia is smaller than in the specimens from springs with banks open to the light. It seems to me that this fact can serve to show the possibility of a complete reduction of the pigmented eye of *Synurella* under the influence of darkness, and consequently the passage of *Synurella ambulans* into *Boruta tenebrarum*. Probably forms of *Synurella*, intermediate between the two species, can be found in wells.

---

* Wrzesniowski, A., "Ueber drei unterirdische Gammariden," Zeitschr. f. wissensch. Zool. Bd. xv. (1890).

VIII.—*Diagnoses of new Genera and Species of South African Marine Fishes.* By K. H. Barnard, D.Sc., F.L.S.

(Published by permission of the Trustees of the South African Museum.)

The following paper includes descriptions of seven new genera and eighteen new species of marine fishes contained in the collection of the South African Museum. A *nomen novum* is proposed in the case of one species with a preoccupied specific name.

Ammodytes capensis, sp. n.

Depth 13½–14 in length, equal to length of mandible, and 3 in length of head, which is 4⅔–4¾ in length of body. Eye 2 in snout, equal to interorbital width, 7½ in length of head. Maxilla extending to below anterior margin of eye, or a little further. D. 49–51. A. 24–26. Margins of dorsal and anal undulate. Pectoral slightly longer than lower jaw. Scales on posterior part of body only, commencing about at level of middle of anal; no oblique folds of skin. Lateral line consisting of a closed canal opening by a series of 46 pores above the line and twice as many below; open pores ceasing at a distance from base of caudal equal to about twice the depth of body. Up to 165 mm. Bluish or greenish above, more or less silvery, a brilliant silver lateral stripe.

Locality. Table Bay, False Bay, "Kaffrarian" coast.

This species has already been recorded from South Africa as provisionally the same as the Mediterranean and N. Atlantic species *siculus*, Swains. (=*cicerellus*, Raf.). Examination of several specimens, however, convinces me that it should be regarded as specifically distinct. The numbers of dorsal and anal rays are very constant and distinctly less than in *siculus*. The number of pores in the lateral line in *siculus* is not given by either Günther or Smitt; there may possibly be a difference in this respect also between the northern and southern forms.

PLEUROSCOPUS, gen. nov. (Uranoscopidæ).

Body scaly. Scales thickened, subtubercular, not imbricate except at base of tail, but scattered more or less closely on the surface, not in pits. Top of head almost entirely bony. Interorbital very broad. Ramus of lower jaw dilated near symphysis, but without spinose projection. Eyes lateral, each surmounted by a strong supraorbital tubercle. Opercle not free above, without fringe. Gill-openings not extending above upper end of pectoral base. A strong humeral spine, but no fringed appendage. No spines on pre- or suboperele. A group of conical tubercles on the pelvis. Spinous dorsal absent, but represented by a series of short immovable tubercles. Soft dorsal and anal short. Membrane inside lower jaw without filament. Lateral line obscure, running nearly in middle of side. Vent far back.

The remarkable fish for which this genus is proposed is distinguished from all other Uranoscopids by the laterally placed eyes, the series of tubercles representing the last trace of the obsolete spinous dorsal fin, and the very short soft dorsal and anal fins. In most other respects it resembles *Gnathagnus*, Gill, from Japanese and Australian seas.

Pleuroscopus pseudodorsalis, sp. n.

Body depressed anteriorly, compressed posteriorly. Depth $4\frac{1}{3}$, length of head $2\frac{2}{3}$, in length of body. Greatest width of head $\frac{9}{11}$ of length. Bones of head strongly granular, naked areas very narrow. Eye subequal to snout, $2\frac{1}{2}$ in interorbital width, $4\frac{1}{5}$ in length of head. Suborbital as deep as vertical diameter of eye. Preorbital without projecting spines. Lower margin of preopercle and subopercle without spines, but with irregularly spaced granular tubercles which are larger than the other granules on head. Two short and low occipital ridges distant from one another one eye-diameter. Humeral spine about as long as eye-diameter, its base overlapped by the flat bluntly pointed posterior end of the granulose supraclavicular. A low horizontal ridge across the upper part of opercle. Lower jaw granular, the granules largest near the symphysis. Teeth in lower jaw in a single series, subequal; two rows in upper jaw, smaller than those in lower jaw except the two median pairs; a single row on palatine and a transverse single row of eight on vomer. Lips not fringed. Intralabial membrane with entire margin without protrusible filament. Gill-rakers obsolete. Branchiostegals six, enclosed in thick fleshy folds. Anterior nostril with short pointed filament on its posterior margin. D. IX.+II. 8. The 1st dorsal is represented by nine short, conical, bifid or multifid, immovable tubercles, commencing in a line with apex of humeral spine, distant about 7 mm. one from another. The 2nd dorsal commences about the same distance from the last immovable tubercle; the 1st spine is very short (4 mm.), but is freely movable and connected by membrane with the 2nd which equals half the eye-diameter in length; 4th soft ray longest, twice the eye-diameter. A. II. 8, opposite soft dorsal, the two spines feeble, short, 1st about half eye-diameter, 2nd injured, 5th ray longest, about equal to 4th ray of dorsal. P. 21–22. Caudal rounded-truncate. Scales about 60 between base of humeral spine and base of caudal; each scale has a central tubercle with radiating ribs, which are often granulose; towards caudal peduncle the scales become more or less distinctly arranged in transverse rows, and slightly imbricate on base of caudal; scales present on base of pectoral, but absent from belly which is corrugate and rugulose and probably distensible. Chin naked, the skin in front of the pelvic tubercles forming transverse, lobate, and lamellate folds. Distance of vent from opercle nearly equal to its distance from base of (median) caudal rays. Pyloric cæca ten. 330 mm. Grey below, slaty-blue above with round black spots which extend along the body and sides of head, soft dorsal and pectoral similarly spotted, caudal and anal greyish, a silvery sheen on opercle and lower jaw, pupil black with a narrow light ring round it, iris black.

Locality. West coast, off Table Bay, probably about 200 fathoms (obtained from a trawler).

PARACALLIONYMUS, gen. nov. (Callionymidæ).

Gill-opening reduced to a small foramen opening dorsally. Lateral line single, with lateral transverse branches, those above being longer than those below the line. Preopercular spine short, simple, sharply pointed, without any denticles or serrations and without antrorse spine at its base. Ventral fins without detached rays. Caudal lanceolate, moderately long.

The institution of a new genus for the single South

African species is justified in view of the unique development of the lateral mucous system. The preopercular spine is also different from that in the other genera.

Type: *Callionymus costatus,* Blgr., 1898.

PALUNOLEPIS, gen. nov. (Chilodactylidæ).

Anterior profile not steeply inclined. Head scaly, without tubercles. Scales moderately large, rough, and granulose in centre with a smooth margin; those on cheeks, opercles, and middle line of breast smaller, well developed, not papilliform. Sheath along base of dorsal fin composed anteriorly of one row, posteriorly of two rows of scales; sheath along anal of one row. A naked groove between the sheath and the body-scales. Dorsal spines evenly graduated. Anal short, spines not very strong, anterior rays considerably longer than the posterior ones.

The fretted appearance (as if sand-blasted) of the scales and the naked groove below the dorsal sheath are very distinctive features, which appear to be absent in all the other genera of this family.

Type: *Chilodactylus grandis,* Gnthr., 1860. *C. brachydactylus,* C. & V., also belongs to this genus.

Apogon ocellatus, von Bonde, 1923.

As this name is already preoccupied by Weber, 1913, I propose the name *duops,* nom. nov.

PARAHYNNODUS, gen. nov. (Apogonidæ).

Body rather elongate, with moderate-sized ctenoid scales. Head scaleless. Eye very large. No teeth in the jaws or on palate or tongue. Preopercle with submarginal ridge, outer margin thin, quadrate, entire. Opercle with a·low horizontal ridge ending in a spine. Maxilla narrow, concealed beneath the narrow preorbital, except the posterior end. 1st dorsal with seven spines. 2nd dorsal with eight rays. Anal with two spines and eight rays. Anal arising below posterior third of 2nd dorsal. Caudal emarginate (?). Vent close in front of anal. Lateral-line pores simple.

Close to *Hynnodus*, Gilb. (1905. Bull. U.S. Fish. Comm. xxiii. 2, p. 617), and especially to *Scepterias*, Jord. & Jord. (1922. Mem. Carn. Mus. x. p. 44), but differing in the complete absence of teeth, fewer soft dorsal and anal rays, and slightly larger scales. Gilbert's description of the lateral-line scales in *Hynnodus* does not apply to those of the Cape species.

Parahynnodus robustus, sp. n.

Depth $4\frac{2}{3}$, length of head 3, in length of body. Eye $2\frac{1}{3}$, snout $4\frac{1}{2}$, interorbital width 4, in length of head. Maxilla extending to below anterior third of eye. Lower jaw projecting, ending in two small points; two pores below. Gill-rakers twenty-two on lower part of anterior arch, long, strong, and closely-set. D. VII. + I. 8, 1st spine very short, 3rd longest, slightly longer than eye. A. II. 8. Scales: l. l. 48, l. tr. $\frac{3}{11}$. Pyloric cæca 5. 170 mm. Pale (as preserved), mouth and branchial chamber also pale, peritoneum brown.

Locality. Off Cape Point, 460 fathoms.

The single specimen is well preserved, though the tail is broken, and most of the scales except those along the lateral line are lost.

Eleotris delagoensis, sp. n.

Body moderately compressed. Depth $4\frac{1}{3}$, length of head 3, in length of body. Head about as broad as deep. Eye $4\frac{1}{2}$ in length of head, slightly smaller than snout, slightly greater than interorbital width. Maxilla extending to below anterior third of eye. No canine teeth. No preopercular spine. D. VI. + I. 8. A. I. 9. P. 21, longer than ventrals. Scales ctenoid: lat. series 28, tr. series 9. Head scaly except on interorbital, snout, suborbital, and mandibles. First gill-cleft reduced in size. Gill-rakers thirteen on lower part of anterior arch, moderately developed. Pseudobranchiæ well developed. A row of small spiniform cutaneous projections on supraorbital, continued on to snout. Rows of papillæ: six vertical rows below eye, with a horizontal row below them, around lower edge of preopercle, and in a groove below mandible. 58 mm. Brownish, with irregular darker mottling, dorsals and anal dark, the latter with light margin.

Locality. Delagoa Bay.

This species is easily distinguished by the large scales and the rows of papillæ on the head.

Gobius durbanensis, sp. n.

Body moderately compressed posteriorly. Depth $4\frac{3}{4}$, length of head $3\frac{1}{4}$, in length of body. Head broader than high, breadth $1\frac{1}{3}$ in length. Eye $4\frac{3}{4}$ in length of head, equal to snout, rather less than interorbital width. Jaws subequal. Maxilla extending to below centre of eye. Teeth villiform, no canines. D. VI.+I. 7, the two fins narrowly separated. A. I. 7. P. 16, upper rays not filamentous. Ventrals not reaching vent. Caudal rounded, shorter than head. Scales ctenoid: lat. series 38 tr. series 12. Scales extending forwards on head to behind eyes, and on upper part of opercle, rest of head naked. Obscure series of papillæ on cheeks, preopercle, and opercle, and a series round edge of preopercle continued on to lower surface of mandible. No flap on shoulder-girdle. Tongue free, rounded. Gill-rakers and pseudobranchiæ reduced. 45 mm. Brown (as preserved), with irregular cross-bands, the hindmost one being on base of caudal, 1st dorsal with a blackish band and a light margin, other fins grey.

Locality. Durban Bay.

This species is close to the Madagascan *G. simplex*, Sauv., in the fin and scale formulæ, but differs in the broader head and interorbital, and absence of canines.

Gobius agulhensis, sp. n.

Body feebly compressed. Depth 5–5½, length of head 3⅓–3½, in length of body. Head 1⅓ times as long as broad, a little broader than high. Eye 4 in length of head, about equal to snout. Interorbital space very narrow. Jaws subequal. Maxilla reaching to below anterior margin of eye. Teeth with the outer series enlarged, no canines. D. VI.+I. 11, the two fins narrowly separated. A. I 10. P. 21, upper rays not filamentous. Ventrals reaching to, or nearly to vent. Caudal rounded, shorter than head. Scales ctenoid : lat. series 44–46, tr. series 11–12. Head, whole area in front of 1st dorsal, and base of pectoral naked. Vertical and horizontal series of papillæ on cheek and opercle, a series round lower edge of preopercle continued (in a groove) on to lower surface of mandible. A small flap on front margin of shoulder-girdle usually present. Tongue free, apically rounded. Gill-rakers reduced to 6–7 knobs on anterior arch. Pseudobranchiæ moderately developed. Up to 90 mm. Light brown (as preserved), with darker irregular blotches on sides, sometimes forming more or less definite cross-bars, 1st dorsal faintly barred, with (in adult) a black blotch between 4th and 6th spines, 2nd dorsal faintly spotted, anal usually grey, ventrals often dusky.

Locality. False Bay, St. Sebastian Bay, Mossel Bay, off East London, 20–40 fathoms.

Gobius saldanha, sp. n.

?1923. von Bonde, Fish. Mar. Surv. Spec. Rep. i. p. 28 (*spectabilis*, non Gnthr.).

Body moderately compressed. Depth 5, length of head 3½, in length of body. Head longer than broad. Eye 4 in length of head, equal to snout, twice the interorbital width. Jaws about equal (specimen preserved with jaws open). Maxilla reaching to below anterior margin of eye. Teeth villiform, none enlarged; no canines. D. VI. + I. 11, contiguous. A. I. 10. P. 19 + ca. 5, the upper rays filamentous. Ventrals reaching origin of anal fin. Caudal rounded, shorter than head. Scales ctenoid: lat. series 35–36, tr. series 10. Head, whole area in front of 1st dorsal, and bases of pectorals naked (only a few small scales on chest in advance of ventrals). Groups of papillæ on cheek, post-orbital and opercle, a series round edge of preopercle continued (in a groove) on to lower surface of mandible, two larger papillæ in median line on interorbital. No flap on shoulder-girdle. Tongue rounded, apparently adnate (but this may be due to the specimen having been preserved with the mouth widely expanded). Gill-rakers short, 6–7 on lower part of anterior arch. Pseudobranchiæ moderately developed. 85 mm. Light brown (as preserved), both dorsals, anal, and ventrals dusky.

Locality. Saldanha Bay, low tide.

This species would appear to have some affinity with *G. jozo* from the Mediterranean and the coasts of Morocco and Mauretania.

Von Bonde's identification of a specimen also from Saldanha Bay as *spectabilis*, Gnthr. (=*giuris*, Ham. Buch.), is probably erroneous; the specimen probably belongs to this species.

Gobius (*Oxyurichthys*) *nuchalis*, sp. n.

Body compressed. Depth 5–5½, length of head 3⅔–3¾, in length of body. Head rather higher than broad, height 1½ in length. A low longitudinal crest from occiput to 1st dorsal. Posterior rim of orbit prominent, a transverse groove behind it. No tentacles. Eye 3½ (young)–4 in length of head, 1–1⅓ in snout, 3–4 times the interorbital width. Snout blunt, profile abruptly descending. Upper jaw slightly overlapping lower. Cleft of mouth nearly horizontal. Maxilla reaching to below posterior third or posterior margin of eye. Teeth conical, in a single series in both jaws, but with 2–3 behind front row at symphysis of lower jaw, no canines. D. VI.+I. 12–13, contiguous or almost so. A. I. 13. P. 22, upper rays not silk-like. Ventrals reaching to vent, the margin of basal membrane fimbriate. Caudal lanceolate, longer than head. Scales ctenoid, except those on temporal region: lat. series ca. 50 (no complete series remains on any of the specimens), tr. series 12. Scales extending on to the temporal region nearly to hind margin of eye, but leaving base of the nuchal crest bare. Series of papillæ on preorbital, postorbital, occipital, cheek, preopercle, and opercle, a series round edge of preopercle continued on to lower surface of mandible. No flaps on shoulder-girdle. Tongue free-rounded. Gill-rakers six on lower part of anterior arch. Pseudobranchiæ 2–3 filaments. Up to 110 mm. Pinkish brown (as preserved), eyes black, dorsals, pectoral, and caudal hyaline, but with indications of spots on 2nd dorsal and of a dark spot on hind part of 1st dorsal, anal and ventrals dusky.

Locality. Zululand coast, 36–42 fathoms.

This species is closely related to *G. cristatus*, Day, and *tentacularis*, C. & V. From the former it differs in having ctenoid scales, and from the latter in the absence of the orbital tentacle. From both it is distinguished by the abrupt profile, the horizontal mouth and the lower jaw being slightly included in the upper.

Blennius fascigula, sp. n.

Depth $4\frac{1}{2}$, length $3\frac{1}{2}$, in length of body. Eye $2\frac{1}{2}$ in length of head, $1\frac{1}{2}$ times interorbital width, greater than snout. Profile of head very abruptly descending. Nasal tentacle short, fringed; supraorbital tentacle very short, $\frac{1}{3}$ diameter of eye, fringed. No occipital crest. No canines visible. D. XII. 23, commencing above hind margin of preopercle, not notched, not joined to caudal. A. II. 20. Lateral line anteriorly a double row of pores. Gill-membrane forming a fold across throat. 40 mm. Light brown (as preserved), with five dark transverse bars, extending on to dorsal and anal, head and pectoral fin dotted, three transverse, dark, angular bands across throat and one across chin, a dark cross-bar on caudal.

Locality. 'Pieter Faure' collection, without precise locality.

This little specimen does not seem to agree with any of the described species. It has the banded throat found in *tentacularis*, Brünn., and *pavo*, Risso, from the Mediterranean, and by this character is easily distinguished from the other South African species.

CLINOPORUS, gen. nov. (Clinidæ).

Closely resembling *Clinus*. Hook on inner margin of shoulder-girdle present. No scales. Lateral line with a series of short transverse, alternating branches, each opening by a pore, a single pore at end of lateral line between ends of dorsal and anal fins.

The character of the lateral line, which resembles that found in *Xiphidion*, distinguishes this genus from *Clinus* and its subgenera.

Type: *Clinus biporosus*, G. & T., 1908.

Lycodonus vermiformis, sp. n.

Body very slender. Depth 22–25, length of head about 10 in length of body. Eye equal to (young) or rather less than (adult) snout, at least twice interorbital width, 4 (young)–4¾ (adult) in length of head. Length of head not quite half distance from tip of snout to vent, which distance is about 4 in distance from vent to tip of tail. Cleft of mouth extending to below anterior margin of eye. Teeth in single rows on jaws, vomer and palatine, a few smaller teeth behind the outer ones in front of each jaw. Gill-openings extending downwards to level of bottom of bases of pectorals. D. ca. 115, commencing above end of pectoral. A. ca. 100. Both dorsal and anal flanked by the same number of bony scutes as there are rays (the dorsal scutes not commencing in front of the 1st ray). P. 14–15. Lateral line absent. A row of large mucous pores along side of head below eye, and a similar row on under surface of head extending on to lower jaw. Up to 270 mm. Yellowish brown (as preserved), belly blackish, throat and gill-cavities fuscous.

Locality. Off Cape Point, 460–630 fathoms.

These specimens evidently represent a species distinct from *mirabilis*, G. & B., from the east coast of N. America. Besides the differences in fin-formula, the dorsal scutes in the latter commence much further forward than in *vermiformis*, and the first 10–11 appear to be unaccompanied by rays. I am unable to find more than four branchiostegal rays.

Neobythites analis, sp. n.

1914. Gilchrist and Thompson, Ann. S. Afr. Mus. xiii. p. 89 (*macrops*, non Gnthr.).

Depth 5½–5¾, length of head 4¾–5, in length of body. Eye equal to snout, and to interorbital width, 4½ in length of head. Maxilla reaching to vertical from hind margin of eye. Gill-rakers 14–15 on lower part of anterior arch, the posterior 6–7 long, the anterior ones mere knobs. Pseudobranchiæ four filaments. Posterior nostril near but not contiguous with eye. D. ca. 100, commencing above axil of pectoral. A. ca. 85. P. 26. Ventrals about half distance between their bases and vent, which distance is slightly greater than length of head; each pair of rays united in their basal third, inner ray longer than outer. Lateral line distinct to end of tail (in well-preserved specimens); 7–8 scales between lateral line and anterior rays of dorsal fin. Pyloric cæca in two rows of five each along mesenteric attachment of gut, none around the pylorus. Up to 170 mm. Uniform brownish, dorsal fin light, caudal dusky, anal light with a black margin.

Locality. Algoa Bay and Natal coast, 46–700 fathoms.

This species, although very close to *macrops*, Gnthr., from the Indo-Pacific, is readily distinguished by the shorter head relative to the distance between base of ventrals and vent, the arrangement and number of the pyloric cæca, and the coloration. The black margin of the anal fin is very characteristic.

Most of the specimens taken by the s.s. 'Pieter Faure' were taken in depths of 46–63 fathoms, though some were taken at 185 fathoms. The 'Pickle' specimens, which are presumably this species and not the true *macrops*, were mostly taken from deeper water.

COCCOTROPSIS, gen. nov. (Scorpænidæ).

Differs from *Coccotropus* in having three anal spines and four rays, all the soft fin-rays apically branched, and the preorbital and preopercular spines sharp. Scales absent, skin perfectly smooth. Gill-rakers almost rudimentary, seven on anterior arch.

The original genus *Tetraroge* has been considerably subdivided, and the adoption of this course necessitates, unfortunately, another new genus.

Type: *Tetraroge gymnoderma*, Gilch., 1906.

COTTUNCULOIDES, gen. nov. (Cottidæ).

Head very large, the body tapering rapidly to the slender tail. Mouth large, terminal, oblique. Villiform teeth in jaws; none on vomer or on palatines. Bones of the head more or less spinose, the spines not penetrating the skin. Gills $3\frac{1}{2}$, no slit behind the last arch. Gill-membranes broadly joined to isthmus. Pseudobranchiæ very small. Skin naked, smooth or with small granules, loose and flabby. Spinous and soft dorsal united by and concealed in the skin. Ventrals short, with three rays.

Differs from the N. Atlantic and Japanese genus *Cottunculus* by the complete absence of vomerine teeth.

Type: *Cottunculus inermis*, Vaill., 1888. *C. macrocephalus*, Gilch., 1904, is a synonym. *C. spinosus*, Gilch., 1906, also belongs to this genus.

Careproctus albescens, sp. n.

Depth $4\frac{3}{4}$, length of head $3\frac{3}{4}$, in length of body. Eye $3\frac{3}{4}$ in length of head. Profile of head evenly rounded, snout rather vertical (but shape possibly altered by the specimens resting on their snouts in the jar). Teeth mostly simple, but a few tricuspid. Gill-opening not extending below base of upper pectoral ray. D. ca. 50. A. ca. 45. P. 35, lower rays (ca. 17) not strongly produced. Diameter of ventral disc 5 in length of head. Skin smooth. Distance of vent from posterior margin of ventral disc greater than diameter of disc, about equal to diameter of eye. Pyloric cæca 12. Up to 100 mm. (the best-preserved and type specimen 65 mm.). Whitish (as preserved), peritoneum dark brown.

Locality. Off Cape Point, 630–800 fathoms.

With the exception of the type the specimens are all very soft and rather badly preserved, but they serve to confirm the above characters. There seems no doubt that the species is a true *Careproctus*.

PSEDNOS, gen. nov. (Liparidæ).

Ventral disc absent. Teeth simple, on jaws, none on vomer or palatine. Mouth very oblique, lower jaw projecting. No barbels. Pseudobranchiæ absent. Pectoral not divided into two lobes. Caudal completely confluent with dorsal and anal. Vent far forward, between lower extremities of bases of pectorals. General outline tadpole-like, head and trunk nearly circular, tail abruptly narrower.

The distinctive shape of the body, which is not due to distension with eggs, and the strongly oblique mouth serve to distinguish this genus from all the other genera in this family. Resembling *Amitra* in the pectoral, but differing in the absence of pseudobranchiæ, as well as in the above two characters.

Psednos micrurus, sp. n.

Depth 3¼, length of head 4½, in length of body. Eye 3 in length of head, equal to snout and to postorbital portion of head. Maxilla reaching to below anterior third of eye. Lower jaw projecting, with a knob on chin. D. ca. 35. A. ca. 30. Distance from snout to origin of dorsal nearly twice, to origin of anal 2⅓ times, length of head. P. 17, rays at least as long as head, the lower rays probably slightly longer. Pyloric cæca 4, short and stout. Up to 45 mm. Greyish brown (as preserved).

Locality. Off Cape Point, 660–700 fathoms.

The type has the body-cavity filled with a number of large eggs, 1 mm. in diameter. Another specimen of the same size is rather badly mutilated, but confirms the above characters.

Platycephalus heterolepis, sp. n.

Length of head 2¾ in length of body. Eye 1½ in snout, 4⅓ in length of head. Interorbital width 2¼ in eye. Supraorbital, scapular, and occipital ridges finely serrulate. A pair of nasal spines. Two antorbital spines. Two preopercular spines, the upper stronger and half the diameter of eye, a third still smaller below. Opercular membrane scarcely indented below preopercular spines. Vomerine teeth in two longitudinal bands; palatine teeth in a band about as wide as vomerine; no canines. D. I.+VIII. 12. A. 12. Scales moderate: l. l. 52–55, the first 15–20 with small spines; scales on the breast and throat larger than the others, feebly ctenoid. 200 mm. Brownish, spinous dorsal blackish, all the other fins except anal spotted.

Locality. Delagoa Bay (coll. K. H. B.).

This species is closely allied to *P. tuberculatus*, C. & V., *townsendi*, Regan (1905, J. Bomb. Nat. Hist. Soc. xvi. p. 323, pl. A, fig. 1), and *jugosus*, McCull. (1914, Res. F.I.S. 'Endeavour,' ii. 3, p. 144, pl. xxx. fig. 2 & text-fig. 11). It resembles *tuberculatus* in the sculpturing of the head, but is like *jugosus* in not having the infraorbital ridge projecting over the cheek below it. It differs from both species, and, so far as can be ascertained from descriptions, from all other species by the enlarged scales on the breast and throat.

Cantherines modestoides, sp. n.

Skin minutely granular, soft and velvety. Depth 2 (back to ventral spine) (2¾ between origins of soft dorsal and anal) in length. Eye 3 in snout, whose dorsal profile is straight or very slightly convex. D. I. + 37. Spine ⅔ length of head, situate above middle of orbit, rough in front, posterior margins with a series of laterally projecting small barbs. A. 36. Soft dorsal and anal anteriorly elevated. Ventral spine small, but well marked. Caudal peduncle slightly longer than half length of snout. Caudal fin rounded. 210 mm. Uniform grey-brown (as preserved).

Locality. Algoa Bay.

This species seems most nearly allied to *modestus* (Gnthr.), but has a larger eye and deeper body (at the level of the ventral spine).

Cantherines arenaceus, sp. n.

Skin with distinct scales, each of which is granulate or spinulose, the surface therefore rough. Depth a little over 2 (back to ventral spine) (2½ between origins of soft dorsal and anal) in length. Eye 3½ in snout, whose upper profile is straight or very slightly concave. D. I. + 32. Spine (broken) apparently about ⅔ length of head, situate above middle of orbit, rough in front, posterior margins with a series of laterally projecting small barbs. A. 30. Soft dorsal and anal low. Ventral spine well marked. Caudal peduncle rather longer than half length of snout. Caudal fin rounded. 230 mm. Uniform brown (as preserved).

Locality. South African seas (exact locality lost, probably Natal).

This species appears to be allied to *trachylepis* (Gnthr.), but has fewer rays in the soft dorsal and anal.

Batrachoides melanurus, sp. n.

1914. Gilchrist and Thompson, Ann. S. Afr. Mus. xiii. pp. 71, 72 (*apiatus*, non C. & V., and *diemensis*, non Lesueur).

Depth 4–4½, length of head 2⅔–3, in length of body (the depth less and the head longer proportionately in the young). Eye 4–4½ in length of head, slightly greater than snout, and 1½ times the width of the bony ridge between eyes. Outline of mouth viewed from above well curved. Teeth in a double, occasionally partly triple, series in front of jaws; 7–8 subequal teeth on palatine. D. III. + 19–20. A. 14–16. P. 22, not, or scarcely, reaching origin of anal. Spine of ventral fin with thick fleshy cover. Top of head smooth, not wrinkled. Anterior nostril fimbriate. Short tentacles and papillæ on snout, behind and below orbits, behind angle of mouth, and on lower surface of mandible. No supraorbital tentacle. Lateral-line pores double. Up to 200 mm. Light brown, with four irregular dark brown cross-bands, the last on the caudal peduncle, and more or less numerous small dark spots, fins, including fleshy part of ventral, barred and spotted, caudal with distal half or three-quarters dark with a light margin.

Locality. Agulhas Bank to Natal, 25–100 fathoms. One specimen, evidently a straggler, from west side of Cape Peninsula.

I have examined the specimens described by Gilchrist and Thompson, and find that they both belong to this species. The descriptions are inaccurate.

Bathybatrachus albolineatus, Gilch. & von Bonde (Fish. Mar. Surv. Spec. Rep. vii. p. 21, pl. vi. fig. 1, 1924), very closely resembles the above species, apparently differing in the slightly longer pectoral. The description of *Bathybatrachus* discloses no characters by which it can be distinguished from *Batrachoides*. The presence or absence of subopercular spines is not mentioned. I am of opinion that this form will be found synonymous with *melanurus*, in which case *albolineatus* will take precedence.

Batrachoides damaranus, sp. n.

Depth $4\frac{1}{3}$, length of head $2\frac{2}{3}$ in length of body. Eye 7 in length of head, subequal to width of the bony ridge between eyes, and $1\frac{1}{2}$ in snout. Outline of mouth viewed from above well curved. Teeth in a triple series in front of both jaws ; 11 unequal teeth on palatine. D. III.+19. A. 13. P. 21, not reaching origin of anal. Spine of ventral fin with thick fleshy cover. Top of head smooth. Anterior nostril fimbriate. Tentacles as in *melanurus*. No supraorbital tentacle. Lateral-line pores single. 260 mm. Light brown, with four indistinct darker patches, the last on caudal peduncle, and numerous ocelli on head and small round spots on body, fins, including fleshy part of ventral, and caudal, uniform grey-brown.

Locality. Walfish Bay.

Although I have seen only one specimen, this seems a very distinct species, differing from *melanurus* in the smaller eye and uniform fins.

IX.—*A new Subspecies of* Bassaricyon *from Colombia.*
By OLDFIELD THOMAS.

A NUMBER of mammals from the neighbourhood of Bogota have been sent to the British Museum by Brother Nicéforo Maria, of the Instituto de La Salle, Bogota. Among these there are several of interest, such as *Aotus lanius*, *Echinoprocta rufescens*, *Thrinacodus*, *Cavia anolaimæ*, and the pale *Sylvilagus purgatus*, this last showing that a part at least of the mammal fauna has become pallid. Similarly, a *Bassaricyon* is paler than other members of the genus, and might be recognized as a special race.

Bassaricyon medius siccatus, subsp. n.

General characters of true *B. medius* of Western Colombia, the skull of the same rounded shape. Body-colour pale buffy, considerably paler than in other forms of *Bassaricyon*. Head still paler, a paler and more whitish grey than in true *medius*. Under surface pale buffy, an area in the inguinal region white. Backs of ears dull whitish for their terminal halves, these being brown in the other specimens. Hands and feet becoming paler terminally, the digits a dull whitish. Tip of tail with a small whitish tuft.

Skull about as in *medius*.

Dimensions of the type:—

Head and body (approximate) 390 mm.; tail 450.

Skull: greatest length 80; condylo-basal length 75; zygomatic breadth 49·5; interorbital breadth 17·6; breadth of brain-case 34·5; maxillary tooth-row 27·5.

Hab. of type. Guaicaramo, on the Llanos of Villavicencio, east of Bogota. Alt. about 1800′ [*].

Type. Old female. B.M. no. 27. 5. 3. 2. Collected June 1926. Presented by Brother Nicéforo Maria.

Distinguishable from all other members of the genus by its pale colour and light or whitish ears, digits, and inguinal patch.

---

[*] *Cf.* Chapman, "Distribution of Bird-life in Colombia," Bull. Am. Mus. xxxvi. (1917).

X.—*Parallel Evolution in some Opisthoglyphous Snakes, with the Description of a new Species*[*]. By H. W. Parker, B.A.

(Published by permission of the Trustees of the British Museum.)

Of the many instances of discontinuous distribution among the Ophidia, few are more peculiar than that of the genus *Apostolepis*. On *a priori* grounds it appears improbable that a highly specialised burrowing snake from Central Africa should be congeneric with similar burrowing snakes from South America. Yet Boulenger, in describing *Apostolepis gerardi*, from Kikondja, Belgian Congo[†], remarks (translation), "It is not without due reflection, needless to say, that I refer it to a genus all the species of which hitherto described are from South America," and Hale Carpenter[‡], accepting Boulenger's determination, quotes this genus as furnishing a further zoological link between Africa and South America.

Thanks to the kindness of Mr. C. Brunton, the British Museum has recently received a specimen of *A. gerardi* collected by him at Sinoia, Lomagundi District, S. Rhodesia. This accession has enabled the author to make a brief survey of the palates of both Neotropical and Ethiopian species of *Apostolepis* and, for comparison, those of the majority of the allied genera, which are characterised by a short maxilla, a reduced number of teeth anteriorly, and the grooved fangs situated below, or in advance of, the eye. This survey has shown that several of these genera possess a modification which appears only to have been recorded hitherto in the genera *Thelotornis* and *Dispholidus*[§], *i. e.*, a maxillary-ectopterygoid foramen. This foramen has been found to occur in *Apostolepis* (both Neotropical and Ethiopian species) and the allied genera *Elapocalamus*, *Polemon*, and *Miodon*. In the other similar genera (*Amblyodipsas*, *Aparallactus*, *Choristodon*, *Elapops*, *Hypoptophis*, *Macrelaps*, *Rhinocalamus*, *Xenocalamus*, and *Elapomorphus*) the maxilla

---

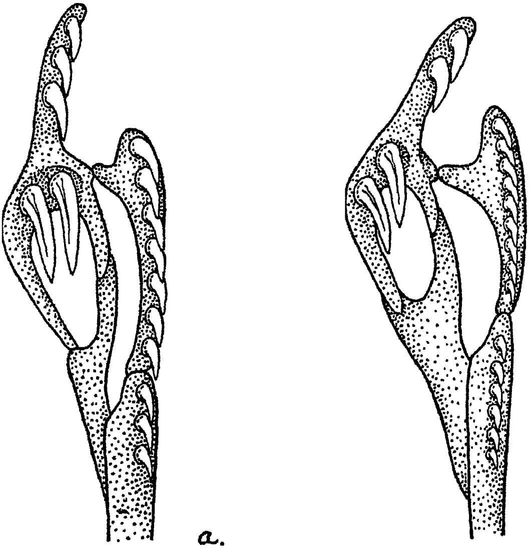
[*] After this paper was in type the author received a copy of the Bul. Antivenine Inst. Am., in which Barbour and Amaral propose splitting off the African species of *Apostolepis* as a distinct genus; the name there proposed has been adopted, but as the reasons which led these authors to such a conclusion are quite different from those expressed in the present paper, no other changes have been considered necessary.

[†] Rev. Zool. Afric. iii. 1, 1913, p. 104.

[‡] 'A Naturalist in E. Africa,' p. 133 (1925).

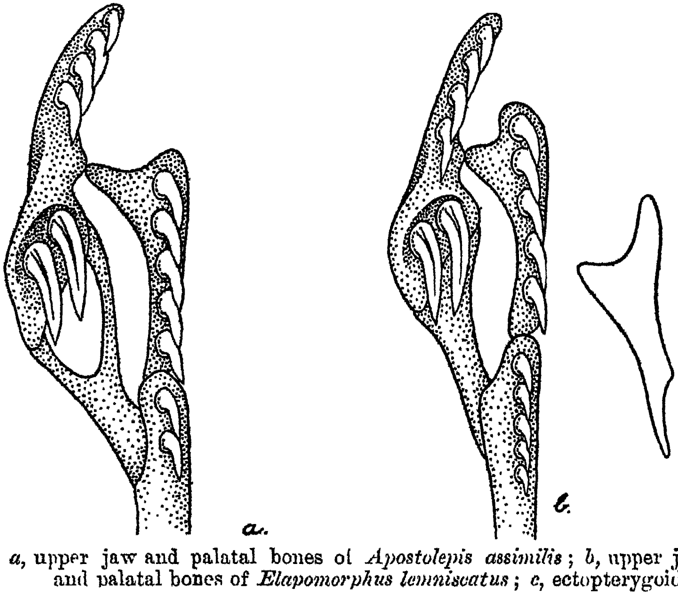
[§] Boulenger, Cat. Snakes B.M. iii. pp. 185 & 186, fig. (1896).

Fig. 1.



a, upper jaw and palatal bones of *Parkerophis* [*Apostolepis*] *gerardi*; *b*, upper jaw and palatal bones of *Miodon notatus.*

Fig. 2.



a, upper jaw and palatal bones of *Apostolepis assimilis*; *b*, upper jaw and palatal bones of *Elapomorphus lemniscatus*; *c*, ectopterygoid of and ectopterygoid articulate normally. Comparison of figs. 1 and 2 will show, however, that the relationships of the bones surrounding the foramen are not always the same. The South American species of *Apostolepis* (fig. 2, *a*), like *Thelotornis* and *Dispholidus*, have a Y-shaped ectopterygoid, which articulates by both branches with a normally shaped maxilla; in *A. gerardi* (fig. 1, *a*) and the Ethiopian genera (*Miodon*, etc., fig. 1, *b*) the ectopterygoid is simple or only slightly Y-shaped, but the posterior end of the maxilla is emarginate to such an extent that it is horseshoe-shaped. This would at first sight appear to indicate that all these genera are comparatively closely allied, the Neotropical species of *Apostolepis* being more nearly related to the genera *Thelotornis* and *Dispholidus* (from the Ethiopian region) than to *A. gerardi*, which is allied to *Polemon*, *Miodon*, and *Elapocalamus*. Such an hypothesis receives no support from any other evidence and would be further complicated by the fact that another American genus, *Trimorphodon*, also has a maxillary-ectopterygoid foramen with a Y-shaped ectopterygoid and a simple maxilla.

The evidence of other characters (dentition, lepidosis, etc.) shows that *Thelotornis* and *Dispholidus* are closely allied and that *Polemon*, *Miodon*, and *Elapocalamus* are a natural group of genera, but there is no evidence that *Trimorphodon* is closely allied to either of these assemblages or these to one another. It appears, therefore, that a maxillary-ectopterygoid foramen must have arisen independently on several different occasions, probably in response to different demands. Among the genera in which the fangs are situated below, or in advance of, the eye, the shortening of the maxilla may be the initial cause; any shortening of the maxilla would leave its posterior end unattached unless compensating movement or elongation occurred elsewhere. This compensation has taken place probably in two, possibly in three, different ways. In the Neotropical species of *Apostolepis* (*A. assimilis*, *borelli*, *nigroterminata*, *pymi*, *quinquelineata*, and *vittata* examined) the ends of the ectopterygoid have been drawn out at their points of attachment to the maxilla; in *Polemon* (2 spp.), *Miodon* (5 spp.), *Elapocalamus*, and the African species of *Apostolepis*, the ectopterygoid is unchanged, or but slightly drawn out to a Y-shape, but the maxilla has been extended at its points of attachment to the ectopterygoid; in the other African genera previously mentioned and in *Elapomorphus* the whole ectopterygoid may have lengthened.

Sufficient comparative osteological material is not available to allow of any definite cause being suggested for the bifurcation of the ectopterygoid in *Dispholidus, Thelotornis,* and *Trimorphodon*, but it is possible that here an elongation of the posterior part of the skull, or of the tabulars or quadrates, with a resulting increase in the size of the mouth has had the same relative effect as the shortening of the maxilla in the other genera.

The resemblances between the Neotropical and Ethiopian species of *Apostolepis* thus appear to be due to parallelism, rather than to phylogeny. Both have been derived from opisthoglyphous ancestors and both have undergone the various modifications which usually accompany a cryptozoic or fossorial habitat among snakes; the head and eyes have been reduced in size and, correlated with this reduction, the head-shields have been lessened in number by fusion or elimination; the body has become slender, the number of scale-rows smaller, and the tail has been shortened and obtusely rounded terminally. In addition, both have acquired "directive mark" coloration of the tail and, in both, the fangs have moved forwards to the level of the eyes. In this last-named modification, however, the same result has been achieved by different methods, and, since in the African species the changes which have occurred are exactly similar to those which have taken place in the Ethiopian genera *Miodon, Polemon,* and *Elapocalamus,* the erection of a genus allied to these seems warranted.

PARKEROPHIS.

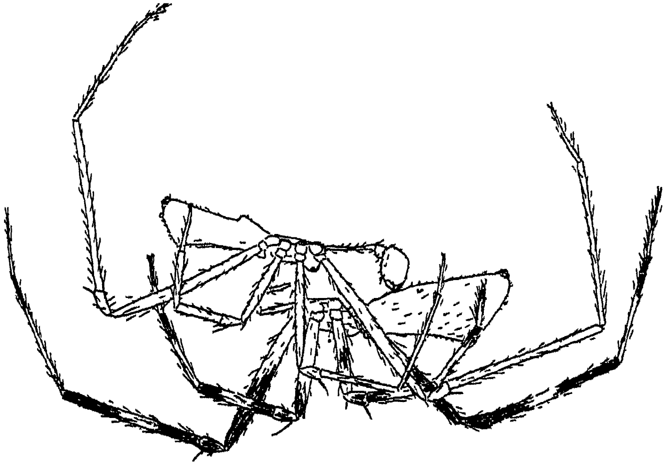
Parkerophis, Barbour and Amaral, Bul. Antivenine Inst. Am. i. 1927, p. 25.

Maxilla very short with 3 or 4 small teeth, followed after a short diastemma by a pair of large grooved fangs, situated below the anterior border of the eye; a maxillary-ectopterygoid foramen; posterior end of maxilla horseshoe-shaped; ectopterygoid simple; palatine, and sometimes pterygoid, teeth present; mandibular teeth slightly enlarged anteriorly. Head small, not distinct from neck; eye small, with round or vertically sub-elliptic pupil; no internasals, nostril in a single nasal; no loreal; no anterior temporal. Body cylindrical. Scales smooth, without apical pits, in 15 rows; ventrals rounded. Tail short, obtuse; subcaudals in two rows.

The specimen collected in Portuguese E. Africa by G. D. Hale Carpenter and referred to the type-species, *P. gerardi* (Boulenger), apparently represents a distinct species.

violently struggling *Tipula*, and then searched one of its legs for a place to bite. The spiders seem very loth to attack and are not at all easily stimulated, but when they are disturbed can run very quickly.

Mating was observed on June 10th. A male was put into a female's rudimentary web. He showed no sign of excitement, but suddenly, without any warning whatever, the *female*, who had run away to a corner, began walking towards him and went right up to him. He, without any preliminaries, proceeded to apply his right palp. The application lasted 146 seconds, during which time there were pulsations of the male's abdomen. His legs, too, would occasionally be extended and again contracted (all simultaneously), as though with the effort of expressing sperm, for these movements always coincided with an increased swelling of the hæmatodocha *.



Episinus truncatus, ♂ and ♀, in copulation.
(Limbs on near side only are shown.)

The female did not remain absolutely still during copulation as with most spiders, but her legs showed slight movements, which were however slow, so that they interfered in no way with the completion of the act. The relative positions of the spiders were as usual among the Theridiidæ (see fig.). The male after withdrawing his right palp proceeded at once, without any delay, to apply the left. The application lasted 3 minutes 12 seconds, after which the spiders separated. The male, whose abdomen pulsated occasionally, began the usual process of putting his palps through his chelicerae, while the female wandered about spinning some threads and finally came to rest under a twig. But, although they came into contact once, the pair seemed to have lost all interest in one another. The male remained in the female's web for weeks and was in no way molested, probably because his movements being infrequent and slow he did not stimulate her to attack him.

---

* Bristowe (1926) has observed the movements of spines on the legs of *Micrommata virescens* and other spiders during mating, and points out that whatever pressure is exerted to bring about the discharge of the spermatozoa is not confined to the palps but to the whole body. He holds (with P. Bertkau, 1878) that "great pressure of the body-fluid is set up by muscular contraction, and the pressure thus formed forces out the spermatozoa."

The most interesting point that arises from this observation is the way in which the female instantly recognised the male. As far as I could see, he had made scarcely a movement when she advanced towards him, which indicates that display-movements are not necessary for recognition and that recognition is not likely to be their function. Further observations on this point will be discussed in connection with *Theridion varians.*

Theridion varians (Hahn).

This species, which occurs abundantly in most places during the spring and summer months, has no very remarkable every-day habits. The mating, however, presents one or two points of interest. I observed it this year (1926) on May 30th. A male was put into a female's web about 5.5 P.M. He immediately started moving about in jerks, with his abdomen pulsating, and made practically straight for the female, who had not moved and was sitting at the top of the case. He proceeded to bite away the threads just near her, and to spin a few others ; then he went up to her, and there followed an interplay of legs in which the female took part. He now retreated to where he had just been, returned, caressed the female again, retreated, tore down more threads, went back and caressed her again, all this being repeated two or three times, evidently in order to entice the female out to the space he had cleared by biting away threads, where mating could take place. She came forward a little, when he approached her and applied one palp for about half a second, retired, approached again and applied the other. He now continued to apply his palps alternately. The process was watched under a low-power microscope.

Before applying a palp the male would (as in most spiders of this family) tap the female's sternum with the "backs" of his palps, which act probably produces a strong sexual stimulus on her. During the application of a palp the swellings of the hæmotodocha came inwards, the digital joint of the palp being rolled outwards and a little away from the male. On the deflation of the bulb the whole palpal organ was seen to undergo a double twist, first in one direction, then in the other, before coming to rest in its normal position. As usual, the male appeared to pass his palps over and through his cheliceræ between each application, and under the microscope it was evident that it was the *style* which he was putting through his jaws; I have suggested (1926) (2) that he is thus lubricating the style.

Each palp was applied 45 times, and the times during which the applications lasted are interesting. First, the right palp was applied for 72 and the left for 53 seconds respectively, then the times fell off to 6 and 7 seconds, and then to an average of 3 seconds. In a subsequent coition, when the male had just recharged his palps, the first five applications averaged about 50 seconds and again fell off to about 3 seconds. It seems probable that only the first two or three long applications of the palp are really effective and that innumerable short subsequent applications are not really functional at all, but only take place because they are pleasurable to the male, who in the intervals between the applications keeps the female stimulated by his taps on her sternum. On one occasion when they had been together for 2½ hours I found the male merely tapping the female's sternum, and, though occasionally touching her epigynum, not applying his palps at all. A similar case of the effect of such tappings on the female's sternum is described by Petrunkevitch (1911) (3) in an account of the mating of a Theraphosid spider (*Dugesiella hentzi*). The male, having caught the female's opened fangs with some hooks attached to his front legs, pushes back her cephalothorax and "drums with the patellas of the palpi on her sternum, all the time advancing. The female is entirely disabled and either remains motionless or is passively pushed backwards along the ground until she strikes some obstacle." The male applies one palp and after its withdrawal rests a little and then repeats the drumming before applying the other.

After the first copulation the male (of *T. varians*) retired a short distance and made a little bridge of silk across two strands of the web, on which he deposited a drop of sperm with curious movements of the legs, which were half-flexed.

Each palp was now applied to this drop 21 times, and each application lasted about a second. (*Theridion sisyphium* recharges its palps in just the same way.) Copulation then started again after the usual preliminaries; the first few applications of the palp lasted about a minute, but the average time then again dropped to 3 seconds.

The following observation throws some light on the question of the female's recognition of the male. Some males of *Theridion varians* were put into the webs of females of *Theridion denticulatum* (a species very like *T. varians*). Some of these males showed no response, but others appeared to be stimulated sexually, as was shown by the pulsations of their abdomens. The females (*T. denticulatum*), however, invariably attacked the males without the slightest hesitation, although they showed no hostility to males of their own species. Females of *T. varians* never, in my experience, show hostility to their own males before mating, though it is possible that they may attack them subsequently.

Theridion varians has no very interesting cocooning or family habits. The female (as in other species of the genus) is very much attached to her cocoon, which is white, and she never leaves it for long, though, unlike *T. denticulatum*, she will come out to catch flies. One of my specimens constructed a perfect cocoon, but deposited the eggs on the glass of the case about $\frac{1}{3}$ in. away. The eggs are usually laid about the middle of June; and the young emerge in about three weeks and disperse about a week later.

Theridion pallens (Blackw.).

The mating of this little species, which is mature in May, is very interesting. I observed it first on May 22nd, 1926. A male on being introduced into a small case where a female had built her web, began crawling upwards, his abdomen pulsating slightly from time to time. Having found the female, who up to now had made no movement, he began walking about in her vicinity biting away threads and spinning new ones (cf. *T. varians*). He then hung inverted, his legs slightly flexed, and with the second pair began a series of rapid pluckings on the web, otherwise remaining quite still. The female, as though attracted by these movements, came slowly towards him, her front legs outstretched and waving. She stopped whenever the male stopped his movements (which were intermittent) and came on again when he recommenced. She then wandered away from him, but he continued his movements in the same place and she soon came back. When she was quite close the male stopped his movements, advanced and applied one palp for 10–15 seconds. (It looked rather as though both palps were applied simultaneously, but from subsequent observations I think this was not so, although it is very difficult to see clearly with such small spiders.) The relative positions of male and female during copulation were as with other Theridiidæ, except that their spinners were somewhat closer together. They separated after the one application and the male began rearranging his palps and rubbing his legs slowly one against the other.

On another occasion (May 27th) I put a male who had been kept separate for some time into a female's web, and watched him under a low-power microscope. He went straight up to the top of the web and remained in one place inverted. His abdomen pulsated frequently, and every three or four seconds he gave a violent spasmodic jerk on the web, rubbing his palps against each other and against his chelceræ. Soon the movements of the second pair of legs were observed as in the other specimen. They would start by twitching and then their pluckings (which were not quite synchronised) would get stronger, culminating in strong spasmodic jerks. Suddenly the male lunged forward at the female, who had by that time approached, and copulation ensued. Only one application took place, but the swelling of the hæmatodocha was perfectly distinct. It is noteworthy that different specimens of the same species may go through slightly different preliminaries to mating, according, presumably, to their state of sexual desire. However, the function of the male's regular pluckings appears to be obvious enough. Again, it is to draw the female out from her retreat to a clear space in the web suitable for mating.

The curious cocoon made by this species has been described by many writers. The young when they emerge disperse at once and are not fed or tended by their mother.

Males lived in the females' webs for some weeks, and were sometimes found feeding, but never at the same time as the females (as in the case with some species of *Dictyna*). Sometimes females were found eating males, in one case two days after mating. In their natural surroundings the males almost certainly wander from female to female.

Theridion simile (Clerck).

The mating of this species, which I observed on June 28th, rather resembles that of *T. pallens*, except that the tactile display was not so definite or marked.

The female had constructed a web inside a large glass tube. The male was introduced and began wandering about occasionally giving rather spasmodic jerks and pluckings, and spinning continually. The female was again instantly aware of his presence and made some movements, but did not advance at once. His pluckings were now very like those that I have observed in *Zilla x-notada* (Locket, 1926) (2), two or three occurring at once. Very often the female would respond to these.

In his wanderings the male approached the remains of a dead fly in the web, palped it over, and left it. He was now getting more excited, his abdomen pulsated, and the pluckings became more frequent, as did the female's answers. He kept returning to the fly, and soon the female came down to it too, and began to throw threads on to it as though it were live prey, but soon gave it up as the male (who had moved off) began his movements again. He now came right up to her with rapid caresses and, after a rapid interplay of legs, copulation began, the relative positions of the spiders being as usual. They separated almost at once, and although the male made several more attempts to copulate nothing came of them. The female made some very violent jerks as he approached (I do not think they were hostile, as I have never seen the spider make them at other times), which he reciprocated by further pluckings. At this point I was compelled to leave them.

What has been said of *T. varians* and *T. pallens* applies also to this species; the female instantly recognises the male and approaches him as he makes his tactile display.

CONCLUSION.

From a study of the mating-habits of a number of spiders of the family Theridiidæ (the mating of *T. sisyphium*, *T. denticulatum*, *T. lineatum*, and *Steatoda bipunctata* has been described elsewhere) the following points are obvious:—

(1) The method of copulation and the relative positions of the spiders during it is remarkably constant, especially so among members of the same genus.

(2) The females instantly recognise the males of their own species directly they are present, and attack males of a closely allied species. Males, however, are sometimes excited by the threads of a species closely allied to their own.

(3) The function of a tactile display, if it occurs, is to stimulate and entice the female out to a place in the web (often prepared by the male) where mating can take place.

(4) In some species where many applications of the palp take place, only the first few are useful; the large number of short duration which follow simply take place owing to their pleasurable nature.

(5) Females never attack males before mating, but in some species do so after it. Sometimes the male will remain in the female's web for a time and feed there if prevented from wandering.

In conclusion, I wish to express my thanks to Dr. A. R. Jackson, who has checked the classification of some of the species mentioned above.

REFERENCES.

(1) BRISTOWE (W. S.) and LOCKET (G. H.). "The Courtship of British Lycosid Spiders and its probable Significance." Proc. Zool. Soc. London, pt. ii. (1926).

(2) LOCKET (G. H.). "Observations on the Mating Habits of some Web-spinning Spiders." Proc. Zool. Soc. London, pt. iv. (1926).

(3) PETRUNKEVITCH (A.). "Sense of Sight, Courtship, and Mating in *Dugesiella hentzi* (Girard), a Theraphosid Spider from Texas." Zool. Jahrbucher, xxxi. p. 356 (1911).

(4) BRISTOWE (W. S.). "The Mating Habits of British Thomisid and Sparassid Spiders." Ann. & Mag. Nat. Hist. ser. 9, vol. xviii. p. 114 (July 1926).

XIII.—*New Himalo-Chinese Butterflies.*

By H. T. G. WATKINS.

Colias eogene francesca, subsp. n.

Felder described and figured his *eogene* in 1865 ('Reise Novara,' Lep. ii. p. 196, pl. xxvii. fig. 7), giving as locality only "Himalaya," but stating that his specimens (two or more males) were taken by Dr. Stoliczka. The latter, in 1864, made a journey—his first in the Himalaya—from Simla through Spiti and Rupshu, and the type, with *Lycæna stoliczkana*, must have been taken in one or other of these regions. Moreover, Felder's type-figure agrees well with the Ladak series in the British Museum, in which *eogene* is almost always both less red and more narrowly bordered than in Baltistan or Kashmir.

Grum, treating of the various races of the species in Romanoff's 'Mémoires,' iv. p. 330 (1890), assumed, in the absence of definite locality, that the Kashmir broad-bordered form, which he describes at length, is the typical one, and in this he has been followed by Verity and other authors.

A name is therefore required for this heavily-bordered frequently deep rose-vermilion form which is described by Grum and well figured by Verity (Rhop. Pal. pl. xliii. figs. 1 ♂, 3 ♀, pl. xliv. fig. 1 ♀). The females vary considerably both in ground-colour from deep rose to white, and in the maculation of the border, the hind wing being sometimes wholly black except for the fringes and central spot. In the males there is little variation except in the depth of the red.

It should be added that the normal Ladak *eogene* are by no means identical with the peculiar form *leechi*, Grum, with glaucous grey underside, of which the British Museum has three males and six females from the Chonging Valley and an intermediate male from Kardong Pass. It appears to be typical *eogene* exposed to arctic conditions.

Further material is necessary to decide the limits of *e. eogene* and *e. francesca* respectively. Two males from 13,000 feet in Lahoul are the latter, a pair from Kumaon figured in the Ent. Month. Mag. for December 1926 are the former.

Described from six males and seven females in the British Museum, taken by Leech at the Skoro La, Baltistan, 15,000 ft., July 1887.

Callerebia scanda opima, subsp. n.

Considerably larger (♂ 68, ♀ 76 mm.) and more richly marked above and below than typical *scanda*, from which the form occurring at Darjeeling and throughout the Himalaya westward does not differ.

Described from four males and three females from Lachung in Upper Sikkim, taken by Bretaudeau in 1884 at "8000 to 16,000 ft.," but probably not higher than 10,000 ft.

Types B.M. (Oberthür and Elwes Colls.).

Callerebia polyphemus annadina, subsp. n.

The common W. Chinese species, *polyphemus*, Oberthür, was described in 1876 from Moupin in Szechuan; *annada*, Moore, which is not the species usually known under that name but a rare form with a whiter underside and pupilled (not blind) eye-spots, in 1857 from Bhutan.

Among the seven hundred and seventeen *polyphemus* of the Oberthür Collection are twenty-six males and three females taken by Genestier in 1901 on the Salween (Lutzekiang) at about 28° N. which differ racially from the Szechuan form and bear a resemblance to the Bhutan species—indeed, when the fauna of the intervening 430 miles becomes known with any certainty, it is possible and even likely that *annada* (vera) and *polyphemus* may prove conspecific. *Annadina* differs from the type in the obsolence both of the central bands and of the dark terminal shade of hind wing beneath; the spots in 1 *c* and 2 are constant in all the specimens. None have the extra fore-wing spots frequent in typical *polyphemus*, and only one has minute extra hind-wing spots in 4 and 6. The main difference from *annada* is in the larger more diffused spots of the fore wing and the more coarsely sprinkled hind-wing underside with yellow rather than tawny spot-rings.

Loxerebia innupta, South, ♂, nov.

This at present very rare Thibetan species was described by South, in the Journ. Bombay Nat. Hist. Soc. xxii. (2) p. 349 (1913), from two females taken by Bailey at Menkong and Ruta on the Salween, June 16, 1911. A male taken a few days earlier (June 6) at Batang has now come to the British Museum, and is undescribed. It differs from the female in the darker colour and shorter broader wings usual in this genus, and has a very distinct and regular oval black patch of androconia, extending vertically from the subcostal vein to the dorsum of fore wing, and in breadth from the centre of interspace 2 to well within the cell. Otherwise the markings are as in the female, fore wing with apical eye-spot in pale ring, and a minute one in 2, hind wing with complete eye-spots in 2 and 4, the latter with a prominent white centre. On the underside of fore wing it has the same dark subterminal lunules (which in *megalops* are replaced by a regular curved line), and of hind wing the same characteristic whitish-buff shade outside the crenulate median line and the same fairly large distinct eye-spots in 2 and 4 only, the ground-colour a little darker grey. The much rounder and less slanting apical eye-spot of fore wing and in hind wing the postmedian shade and the absence of the ferruginous lines and regular row of minute spots at once distinguish it from *megalops*, of which the British Museum now has specimens from Tatsienlu in Szechuan and Tongchuling in Yunnan, as well as Batang, Menkong, and Gera in S.E. Thibet.

Loxerebia martyr, sp. n.

♂. Distinguished from *sylvicola*, Ob., as follows:—Fore wing, ground-colour paler, apical eye-spots less slanting, their black area forming a nearly round blotch, the black androconial patch narrower and divided by the veins; hind wing with large eye-spots in 2 and 3, and (in three cases) a small eye-spot in 4, but not a chain of spots from 2 to 5; underside of fore wing brownish (not reddish) tawny, eye-spot as above; of hind wing with eye-spots or traces of them from 1 *c* to 6, but those in 2 and 3 are much the most prominent.

Tatsienlu, Szechuan.

Described from four males taken by native collectors for Déjean in the summer of 1893. B.M. (ex Oberthür Coll.).

XIV.—*A further Note on* Nematospiroides dubius, *Baylis,* 1926. By H. A. BAYLIS, M.A., D.Sc.

(Published by permission of the Trustees of the British Museum.)

SOME time after the appearance of my paper (1926) describing this Nematode parasite of the wood-mouse, I received a paper by Dr. R. E. Schulz (1926) containing a description of a new species named by him *Heligmosomoides skrjabini*, from *Mus musculus hortulanus* and *Sylvæmus* [*Apodemus*] *sylvaticus ciscaucasicus*, collected in the Northern Caucasus. What is thought to be the same species is also recorded from a jerboa in Russia. Dr. Schulz, later, very kindly wrote to me and drew my attention to the similarity between my description of *N. dubius* and his description of *H. skrjabini*. I had observed this similarity at the time of receiving his paper, but there was one obvious and apparently important difference.

Dr. Schulz has described the presence of a dorsal ray, which, in his figure (1926, fig. 9), appears to occupy the normal position between the bases of the externo-dorsal rays. I had searched in vain for the dorsal ray in this position in my material, and had come to the conclusion that it must be absent. On the other hand, I had found in my specimens a peculiar structure in the bursa of the male, which I described as a "balloon-like post-cloacal swelling." This is not figured or referred to by Dr. Schulz in his paper, but he informs me in a letter that he thinks something of the kind is present, though he is not sure of its nature. Apart from other slight discrepancies (probably accounted for by individual variation, or by differences of interpretation), two minor differences between the two descriptions may be noted:—

(1) Dr. Schulz describes the presence of a gubernaculum

or accessory piece in the male, though he does not figure such a structure. I have been unable to detect this, but it is possible that it may be present in an imperfectly chitinized condition.

(2) Dr. Schulz states that the number of longitudinal cuticular ridges is as many as fifty in the middle region of the body. I have not seen more than about thirty, but the number may be subject to some variation.

Dr. Schulz, with the kind consent of Professor K. I. Skrjabin, has very kindly sent me, from the collection of the State Institute of Experimental Veterinary Science in Moscow, a pair of worms identified by him as *Heligmosomoides skrjabini*. Most unfortunately some specimens previously sent appear to have been lost in transit, and the only male at my disposal (which I have mounted carefully in glycerine) proves to be in rather unfavourable condition for detailed comparison with my own material. The "post-cloacal swelling" appears to have collapsed, and the whole bursa is much folded and wrinkled, so that I was unable to spread it out sufficiently to see the dorsal ray clearly. In small Strongyloidea such as these it is often impossible to make out all the details of the male bursa in a single specimen unless the material is in the most favourable condition. I have been obliged, therefore, to be satisfied with an examination of the other characters, and a study of the description of *H. skrjabini*, in which I have been greatly helped by Mr. B. P. Uvarov, to whom I am indebted for a most useful translation of the Russian text.

I have re-examined my own specimens with great attention, and find that a dorsal ray is present, in form like that figured by Dr. Schulz, but occupying a very remarkable position, which explains why I had failed to see it. Instead of being at the same level as the bases of the externo-dorsal rays, it is actually on the ventral side of the "post-cloacal swelling," and in a dorsal view (such as that represented in my fig. 3) can only be seen by focussing through this structure. In a lateral view (such as my fig. 2) it is just visible in a position immediately dorsal to the spicules.

As a result of this further study I believe that Dr. Schulz and I were both dealing with the same species. Dr. Schulz informs me that his paper was published about the middle of November 1926, but that he cannot give the precise date. In any case, it appears to have been later than my own, which appeared on November 1st. Accordingly the name *skrjabini*, Schulz, will apparently fall into synonymy with *dubius* for the species. The question now arises, in view of the modifications which have been made in the description, whether it is justifiable to retain the genus *Nematospiroides*. In consequence of the supposed absence of a normal dorsal ray in the male, I suggested in my original description that the two halves of this ray might be represented by a pair of tubercles which are present near the bases of the externo-dorsal rays. I was thus led to consider the species as approaching closely to *Nematospira*, Walton, 1923, in which the dorsal rays are described as arising separately as offshoots from the bases of the externo-dorsal rays. This view can no longer be maintained, and the genus to which the species is most nearly related appears to be that in which it is placed by Dr. Schulz, namely, *Heligmosomoides*, Hall, 1916.

I am inclined to think, however, that it is wise still to regard the species as belonging to a distinct genus, since it shows considerable differences from the species which is taken to be the type of *Heligmosomoides* [*H. polygyrus* (Dujardin, 1845) of Boulenger, 1922] and from the other species (*H. halli*, *H. travassosi*, and *H. yorkei*) which have been assigned to that genus by Dr. Schulz. These differences consist in the very marked asymmetry of the lobes of the bursa, in the presence within it of the problematical structure which I have termed the "post-cloacal swelling," and in the position of the dorsal ray.

The following, therefore, may be given as an emended generic diagnosis :—

NEMATOSPIROIDES, Baylis, 1926.

Heligmosominæ. Body spirally coiled. Cuticle of head dilated and transversely striated. Cuticle of body with faint transverse striations and about thirty (? fifty) longitudinal ridges. Bursa with markedly asymmetrical lateral lobes, the right much larger than the left and with longer and stouter rays. Ventral rays strongly divergent at their extremities. Antero-lateral ray stout, leaving the main lateral stem nearer to its base than the other two lateral rays. Postero-lateral ray diverges widely from medio-lateral. Externo-dorsal rays originating separately, long and slender, but with swollen bases from which spring ventrally a pair of small tubercles. Dorsal ray very small, with four terminal branches, situated on the ventral side of a large post-cloacal swelling which separates it from the externo-dorsal rays.

Spicules simple, filiform, relatively long. Tail of female truncate, with a slender terminal spike.

Hab. Small intestine of rodents.

Genotype: *N. dubius*, Baylis, 1926 (syn. *Heligmosomoides skrjabini*, Schulz, 1926).

REFERENCES.

BAYLIS, H. A. 1926. "On a Trichostrongylid Nematode from the Wood-mouse (*Apodemus sylvaticus*)," Ann. & Mag. Nat. Hist. (9) xviii. pp. 455–464.

SCHULZ, R. E. 1926. "Zur Kenntnis der Helminthenfauna der Nagetiere der Union SSR.—I. Strongylata. 1. Fam. Trichostrongylidæ, Leiper, 1912." [In Russian.] Trud. Ghosudarstv. Inst. Éksper. Veter. Moscow, iv, 1.

XV.—*Two new* Hispinæ *(Col.) from Fiji and New Britain.*

By S. MAULIK.

THROUGH the courtesy of Dr. G. A. K. Marshall, C.M.G., F.R.S., I have had the opportunity of examining the two beetles which are described below.

Family **Chrysomelidæ**.

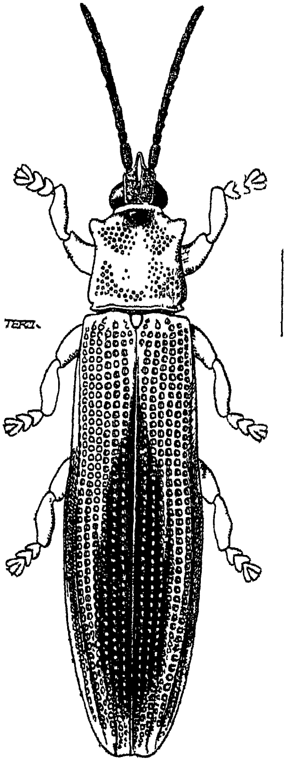
Subfamily *HISPINÆ*.

Brontispa simmondsi, sp. n.

Body elongate, depressed, subparallel-sided; general colour brown, antennæ black, upper surface of head pitchy, eyes black, the middle of the front magin of pronotum suffused with blackish, a large ill-defined irregular patch covering a large part of the elytral surface from behind the basal area up to the apical area blackish, but this patch is not uniform and almost divided into two parts by a long brown streak; some of the abdominal sternites tinged with blackish.

Head: the interocular raised into a rectangular plate which is prolonged into a blunt projection between the antennæ, the upper side of the plate roughly and closely punctate and that of the projection channelled along the middle, the underside of the projection smooth and flat. The first segment of the antennæ the longest, second small, shorter than third, third and fourth equal, fifth and sixth equal, seventh longer; the seven basal segments shining with their surface finely punctate, eighth to eleventh about equal to each other, finely pubescent and not shining; the apex of antennæ appears to be somewhat attenuated. *Prothorax* rectangular, slightly longer than broad, sides more concave in front, the anterior angles broadly rounded and somewhat expanded, the posterior angles deeply incised and ending in a very small spine. Upper surface somewhat flat, sloping down laterally, covered with large and deep punctures, but with small smooth areas at the middle and the sides, the smooth areas being covered with extremely fine punctures, which are only visible under a high power. *Scutellum* pentagonal,

Fig. 1.



Brontispa simmondsi, Maulik.

depressed in the middle, smooth, with a few fine punctures. *Elytra*: sides subparallel, slightly concave at about the middle; upper surface flat, punctate-striate, each elytron having besides a short scutellar row consisting of three or four punctures, eight regular rows on the basal area and ten on the middle area; interstices flat and having very fine punctures, three being raised into sharp ridges at the apex. *Underside* smooth and shining.

Length of elytra 6½ mm.; breadth of elytra at the base 1½; length of prothorax 1¼; breadth of prothorax at the base less than 1½; length of head from the base to the apex of the projection about 1; length of antennæ 2½.

NEW BRITAIN: Witu Islands (*H. W. Simmonds*).

Described from three examples.

Type in the British Museum.

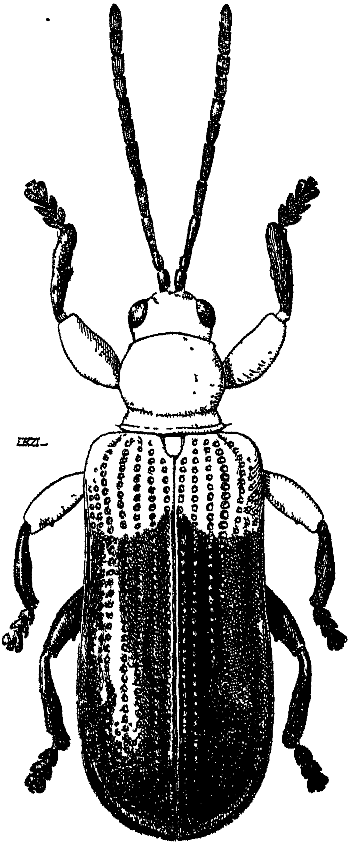
This species resembles *B. froggatti*, Sharp, but is smaller and with different coloration.

Promecotheca bicolor, sp. n.

Body oblong, colour of antennæ (except the last four segments, which are brownish), front and middle tibiæ, and the posterior three-fourths of the body entirely (including the hind legs) metallic greenish blue tinged with purplish, the rest of the body and other parts rich orange-brown.

Head with the vertex plain, smooth, and impunctate. The first segment of antennæ somewhat thicker and longer than second, their surface with some fine punctures, the third the longest, slender, the fourth somewhat shorter than the third and equal to the fifth, the sixth much shorter than fifth and equal to seventh, eighth to tenth equal to each other, eleventh slightly longer and somewhat pointed, the surface of the third to the sixth segments covered with elongate punctures and stiff hairs, the last four segments not so punctate and more thickly covered with hairs. *Prothorax* longer than broad, deeply constricted behind, somewhat narrowed in front, sides strongly convex; surface smooth, with a few very fine punctures; at each posterior angle is a small tubercle bearing a fine seta. *Scutellum* broader at base, rounded at the apex, smooth and impunctate. *Elytra* much broader at the base than the prothorax, very slightly broadened behind; each elytron has on the basal area ten rows of punctures, the fifth and sixth rows uniting and continuing as one, seventh terminated at about the middle; there is no scutellar row of punctures, and on the apical area the rows meet in pairs. The intervals between the series of punctures are broader than usually found in the genus. *Underside* smooth, the femora thickened, the middle and hind ones armed with a minute spine on the underside; tarsi somewhat broad, the claw-segment not projecting beyond the bilobed segment.

Fig. 2.



Promecotheca bicolor, Maulik.

Length 8½ mm.; breadth across the posterior part 3¼; length of antennæ about 4¾.

Fiji: 8 miles out of Suva, feeding on a palm, *Flagillaria* sp., 6. i. 1927 (*R. N. Paine*).

Type in the British Museum.

Described from three examples.

XVI.—*The Occurrence of* Koelreuteria (*Sapindaceæ*) *in Tertiary Rocks.* By W. N. EDWARDS.

(Published by permission of the Trustees of the British Museum.)

1. *KOELREUTERIA* IN AMERICA.

Among the numerous plant-impressions which have been described from the well-known Miocene lake-beds of Florissant, Colorado, is one which was originally named *Ophioglossum alleni* by Lesquereux. This fossil has since been referred to *Salvinia* (by Lesquereux) and *Tmesipteris* (by Hollick), and was later given the non-committal names *Phyllites* (by Florin) and *Carpolithus* (by Cockerell), while Prof. T. D. A. Cockerell (1922) placed it in a new genus *Brachyruscus*, on the supposition that it was allied to *Ruscus*. In 1923 Dr. Hollick (who gave all the earlier references) showed that the fossil was a fruit belonging to the Sapindaceæ or Staphyleaceæ, but for some unexplained reason he did not carry his comparisons to any definite conclusion.

Before considering further the affinities of Lesquereux's fossil, we may examine Prof. Cockerell's reference of it to *Brachyruscus*. Although Prof. Cockerell was "entirely convinced that all the specimens belong to a single species" (1922, p. 212), the figured specimen of *B. alleni* is in effect the type of a new species (p. 213). Having seen the counterpart of this specimen, which Prof. Cockerell has recently presented to the Geological Department of the British Museum (no. V. 18539), I agree with Dr. Hollick that it has nothing whatever to do either with Lesquereux's fossil or with *Ruscus*. The British Museum specimen, though the venation is not preserved, might well be a samara of *Ulmus*, to which it bears a closer resemblance than to *Ptelea*, *Dobinea*, and other similar winged or bracteate fruits. A definite identification, from this specimen alone, is scarcely possible. It should be noted that Prof. Cockerell's drawing is somewhat enlarged; the actual specimen is 25 mm. long. *Brachyruscus alleni*, Cockerell, is therefore not synonymous with *Ophioglossum alleni*, Lesquereux, and the genus *Brachyruscus* rests on an inadequate foundation.

The relationship of Lesquereux's fossil is, however, obscured by leaving it, as Dr. Hollick does, in the form-genus *Carpolithus*. An examination of the fruits of Sapindaceæ and allied families in the herbarium of the British Museum confirms the impression given by Dr. Hollick's excellent illustrations that the affinities of the fossil are with *Koelreuteria*. The constant presence of apical horns or spines in *Staphylea* seems to preclude a reference to that genus, and in *Arfeuilha* the venation is different. The bracteate fruits of *Neuropeltis* (Convolvulaceæ), especially when immature, are somewhat similar, but are at once distinguished by the brochidodrome venation.

The venation of one of the Florissant specimens in the British Museum (V. 11256) is almost identical with that of the carpel of *Koelreuteria bipinnata* figured by Hollick (pl. xii. fig. 2), while the form is like that of *K. paniculata* as figured on the same plate (figs. 3–6). This specimen is 42 mm. in length—that is, somewhat smaller than Dr. Hollick's valves of *K. paniculata*, but a little larger than any of the fossils he figures. Prof. Cockerell's objection (1924, p. 10) that he had never seen two valves in the fossil, and that "were they present they would be indicated by the overlapping of the very open reticulation" is met by the fact that the valves in *Koelreuteria*, of which there are three, easily become detached in dry specimens, and thus were doubtless fossilized separately. This would also account for the frequent absence of impressions of seeds.

It is impossible to identify the fossil with any of the living species, and it may therefore be called *Koelreuteria alleni* (Lesq.). The fruits are stated to be common at Florissant, and one might expect that the leaves would also be represented; yet they have not been recorded, so far as I know, either from this or from any other American Tertiary deposit. The pinnate leaves, however, have very variable leaflets, which, if detached, might well be referred to other genera. To illustrate the difficulties of determination, we may note the resemblance, though there may be no relationship, between some of the leaflets, especially the terminal ones, of *Koelreuteria paniculata* and certain Florissant leaves originally described as *Myrica diversifolia*, Lesquereux. Most of the latter have since been referred to *Sorbus* (together with a fragment first stated to be a new species of *Onoclea*), and one, with a query, to *Ribes*. A more extended use of query-marks in connection with the "identification" of dicotyledonous leaves might be useful. At present there is often no method of distinguishing mere guesses from determinations which may have some degree of probability. If the leaves are to be named at all when the genus is uncertain, the best course would be to use non-committal names like *Dicotylophyllum* or the *-phyllum* termination; in very many cases the genus must remain uncertain, unless there is contributory evidence from associated fruits or cuticular structure.

2. *KOELREUTERIA* IN EUROPE.

(a) *Leaves.*—Heer described as *Koelreuteria* some leaves from the Miocene of Oeningen (1859, p. 63, pl. cxxi. figs. 18–20, and pl. cxxvii. fig. 39 *a*) and from the Tertiary of Spitzbergen (1876, p. 89, pl. xxv. fig. 5). Of the latter he stated that the teeth and nervation agreed so well with his Swiss *K. vetusta* that the two must certainly belong to the same genus. The figures, as a matter of fact, do not agree very closely, and there is no particular reason for including either of them in *Koelreuteria.* Heer's *K. oeningensis*, to which Engelhardt (1873, p. 31) also referred a very incomplete fragment from Saxony, might possibly belong to the genus, but there is no evidence that these isolated impressions were leaflets of a pinnate leaf. An exceedingly poor fragment from Saghalin, named *Koelreuteria ? serrata* by Heer (1878, p. 52, pl. xiv. fig. 10) is unidentifiable. Other authors have recorded some of Heer's species without figures.

From the Italian Eocene, Massalongo (1852) described three species of *Koelreuteria*, not one of which is convincing, and if the original specimens are as poor as the illustrations they are probably unidentifiable. Some authors have included them in *Planera.* One of the figures (pl. iii. fig. 10) is supposed to represent a fruit, but it is not recognizable.

(b) *Fruits.*—The specimen figured by Heer (1859, pl. cxlv. fig. 16) as *Salvinia reticulata* (Ett.) might perhaps be a capsule-valve of *Koelreuteria.* The figure may be badly drawn, but Dr. Hollick's copy (1923, pl. x. fig. 4) rather emphasises the resemblance to *Koelreuteria.* On the other hand, Ettingshausen's *Dalbergia reticulata* from Tokay (1854, pl. iv. fig. 5), with which Heer united his Swiss Miocene "Salvinia," is distinctly nearer to *Koelreuteria* in form and especially venation ; it may well be a European representative of the genus. The specimen from Bohemia figured by Brabenec (1904, fig. 1) as *Salvinia reticulata* might also possibly be a *Koelreuteria.*

The clearest example of the occurrence of a *Koelreuteria* fruit in European Tertiary beds is the specimen figured by Kovats (1856, pl. i. fig. 2) as *Ptelea macroptera,* from Tallya, Hungary. The figure shows part of a large fruit about 4 cm. in diameter, with impressions of two seeds. The same species was recorded by Unger (1870, p. 14, pl. v. fig. 1) from

Szántó, Hungary, though his figure does not show the reticulate venation of the valves. These fruits should be transferred to the genus *Koelreuteria* as *K. macroptera* (Kovats). It is impossible on the present evidence to say whether more than one species was represented in the European Tertiary, or what was the relationship between the fossil and living species.

A seed from the Pliocene clays of the Dutch-Prussian border, described by Mr. and Mrs. Reid (1915, p. 112) as *Stocksia*?, but also compared with *Koelreuteria*, suggests that this genus, or one of its near allies, may have survived in Western Europe until the approach of the glacial period.

Summary.—The sapindaceous tree *Koelreuteria*, now confined to China, grew in North America (Colorado) during Miocene times, and also occurred in Europe at about the same period, although most of the references based on leaves are unreliable.

WORKS QUOTED.

BRABENEC, F. 1904. "Ueber einen neuen Fundort von Tertiären Pflanzen in der unteren Zone von Saazer Schichten." Bull. Int. Acad. Sci. Prague, ix. 2, pp. 1–5, 1 pl.

COCKERELL, T. D. A. 1922. "A new Genus of Fossil Liliaceæ." Bull. Torrey Bot. Club, xlix. pp. 211–213.

——. 1924. "A genuine Fossil *Ophioglossum*." Torreya, xxiv. pp. 10, 11.

ENGELHARDT, H. 1873. "Die Tertiäre Flora von Göhren." Nova Acta Acad. Cæs. Leop.-Car. xxxvi. pp. 1–42, pls. viii.–xiii.

ETTINGSHAUSEN, C. VON. 1854. "Beitrag zur Kenntnis der fossilen Flora von Tokay." Sitz. Ak. Wiss. Wien, xi. pp. 779–816, pls. i.–iv.

HEER, O. 1859. 'Flora Tertiaria Helvetiæ,' iii.

——. 1876. "Beiträge zur Fossilen Flora Spitzbergens." K. Svensk. Vet.-Akad. Handl. xiv. pp. 1–141, pls. i.–xxxii. (Flora Fossilis Arctica, iv.).

——. 1878. "Miocene Flora der Insel Sachalin." Mém. Ac. Imp. Sci. St. Pétersbourg, xxv. pp. 1–61, pls. i.–xv. (Flora Fossilis Arctica, v.).

HOLLICK, A. 1923. "The Taxonomic and Morphologic Status of *Ophioglossum alleni*, Lesquereux." Bull. Torrey Bot. Club, l. pp. 207–213, pls. x.–xii.

KOVATS, J. 1856. "Fossile Flora von Tallya." Arbeiten Geol. Ges. Ungarn, i. pp. 39–52, pl. i.

MASSALONGO, A. 1852. 'Sapindacearum Fossilium Monographia.' Verona, 28 pp., 6 pls.

REID, C. & E. M. 1915. "The Pliocene Floras of the Dutch-Prussian Border." Med. Rijksops. Delfstoffen, vi. 178 pp., 20 pls.

UNGER, F. 1870. "Die Fossile Flora von Szántó in Ungarn." Denkschr. Ak. Wiss. Wien, xxx. pp. 1–20, pls. i.–v.

XVII.—*Additions to the Marine Fauna of St. Andrews since* 1874. By Prof. M'Intosh, M.D., LL.D., D.Sc., F.R.S., &c., Gatty Marine Laboratory, St. Andrews.

[Continued from vol. xix. p. 94.]

Class CRUSTACEA †.

Of the Branchiopoda, *Evadne nordmanni*, Lovén, is common to both northern and southern areas, and in the Ostracoda twenty-one species are found at St. Andrews, six at Plymouth —all differing from the northern species, which were kindly examined by the late Prof. G. S. Brady. Of the Copepods, twenty-four occur at Plymouth and about nineteen at St. Andrews—such species as *Calanus finmarchicus*, *Pseudocalanus elongatus*, *Centropages typicus*, *Temora longicornis*, *Anomalocera patersoni*, *Acartia longiremis*, *Euterpe acutifrons*, and *Oithona plumifera* being common to both areas and some in vast numbers. *Halitemora*, *Harpactius*, and *Dactylopus* seem to be more common in the north, *Isias*, *Parapontella*, *Corycæus*, and *Oncæa* in the south.

It is interesting in connection with the Copepoda that many of the common and most abundant species stretch from the north-eastern shores to the southern waters, and form important elements in the food of the mackerel and other fishes, viz., such Copepods as *Calanus finmarchicus*, *Centropages typicus*, *Pseudocalanus elongatus*, and *Temora longicornis* ‡. Like other marine species many extend to the Mediterranean, where a very large number—both free and parasitic—occur. Dr. Lebour finds that the diatom *Cocinodiscus* is eaten by the Copepods *Calanus*, *Pseudocalanus*, and *Acartia*, and so with other pelagic forms such as *Phæocystis*.

Some authors, such as Hjort, are inclined to connect the appearance of certain Copepods with waters of different salinities. Thus, *Calanus finmarchicus* and *Pseudocalanus elongatus* are characteristic of water having a high salinity, whereas *Centropages hamatus* and *Halitemora longirostris* are found in waters of low salinity. This view, however, is open to doubt, especially as all these forms are found together in St. Andrews Bay.

---

† I am indebted to Mr. Andrew Scott of the Piel Laboratory for revising the list of Copepods, Amphipods, and a few others.

‡ G. E. Bullen, Journ. Mar. Biol. Assoc. 1907–10, p. 269.

The Cirripedes are eleven in number at Plymouth, ten at St. Andrews, seven being common to both. The southern forms are *Balanus perforatus*, Brugière, *B. spongicola*, Brown, *Pyrgoma anglicum*, Leach, and *Clithalamus stellatus*, Poli, whilst in the north, *Balanus hameri*, Ascanius, is characteristic.

The Amphipoda of Plymouth are fewer than at St. Andrews (52 against 63), and there are eighteen in common, the southern types—*Mæra, Chelura, Gamarella, Erichthonius, Unciola, Phtisica,* and *Periambus* being absent at St. Andrews. *Podalirius typicus* is common on *Asterias rubens* in the north.

The Isopods of Plymouth number twenty-nine, whereas at St. Andrews there are nineteen, the species of *Idotea* being more numerous in the north, four being common to both areas. *Apseudis, Tanais, Anthura, Gnathia, Rocinela, Nerocila, Næsa, Astacilla*, and *Munna* are more characteristic of the south.

Almost every Order of the British Crustacea is represented by the same species in the Mediterranean, though many additional forms occur, and the same may be said of the Norwegian waters so diligently searched by Prof. G. O. Sars.

The Cumaceæ are more numerous in the south, the only example at St. Andrews being *Diastylis rathkei*, Kroyer. A single example of the Stomapoda is found at Plymouth —none at St. Andrews. The Schizopods are conspicuous at Plymouth, where twenty-four species occur, whereas only six are found at St. Andrews, though some, like *Nyctiphanes* and *Boreophausia*, sometimes are in immense numbers. No less than twenty-four species occur at Plymouth under the Macrura (including the Paguridæ), characteristic types being *Alpheus, Anthanas, Egeon, Nika*, and *Palinurus*. Ten species are present in both areas. At St. Andrews nineteen species of this group are found, noteworthy species being *Lithodes maia, Munida bamffi*, and *Nephrops norvegicus*, Leach. The Brachyura number thirty-seven at Plymouth, twenty at St. Andrews, and these twenty are common to both areas. In the north the only characteristic form is *Portumnus variegatus*, Leach, in the south *Dromia, Macropodia egyptica*, Milne-Edwards, and *E. longirostris, Achæus, Maia squinado*, Herbst, *Pisa, Eurynome, Xantho* indicate the types found in the warmer area.

Order CIRRIPEDIA.

Suborder OPERCULATA.

Coronula diadema, L.

Attached to *Megaptera longimana*, the Tay whale.

Order BRANCHIOPODA.

Evadne nordmanni, Lovén.

Abundant in tow-nets.

Podon leuckarti, G. O. Sars.

Bottom-net in July.

Order COPEPODA†.

Calanus finmarchicus, G. O. Sars.

Abundant in January and continues to December.

Pseudocalanus elongatus, Boeck.

Abundant throughout the year.

Centropages typicus, Kröyer.

August and September.

Centropages hamatus, Lillj.

Numerous. From April to September.

Temora longicornis, O. F. Müller.

In July.

Halitemora longirostris, O. F. M.

March to December, and often in swarms.

Anomalocera patersoni, Templeton.

Chiefly in August.

Acartia longiremis, Lilljeborg.

Abundant almost throughout the year.

---

† Detailed notes of the occurrence of the Copepods are to be found in the 8th Ann. Rep. Fishery Bd. for Scotland, part iii. p. 270.

Acartia bifilosa, Giesbr.

Surface-net in September.

Longipedia coronata, Claus.

July to October.

Harpactius chelifer, O. F. M.

Rare.

Rhynchothalestris rufocincta, Norman.

Single example in September.

Euterpe gracilis, Claus.

Not common.

Oithona spinifrons, Bk. = *O. helgolandica*, Claus

July to October.

Oithona plumifera, Baird.

Occasionally.

Dactylopusia tisboides, Claus.

Bottom-net, off the Bell Rock.

Pleopis polyphemoides, Leuckart.

Bottom-net in July.

Cyclopina littoralis, Brady.

Bottom-net in July and August.

Dias longiremis, Lilljeborg.

In July.

One Copepod in February (1909) had a parasite projecting from its side a third of its own size and of an elongated form. Unfortunately it was lost.

Lichmologus agilis, Leydig.

On *Doris* and *Triopa*.

Family Bopyridæ.

Phryxus abdominalis, Rathke.

On *Hippolyte*.

Bopyrus aquillarum, Latreille.

Occasionally on *Palæmon.*

Bopyroides galatheæ, Bate & Westwood.

On the gills of *Galathea squamifera.*

Order AMPHIPODA.

**Talitrus locusta*, L.

In the summer evenings swarms leap on the sand near high-water mark, crowding amongst the sea-weeds and decaying animals.

Janassa capillata, Rathke.

Frequent.

Hyperia galba, Mont.

In enormous numbers off the West Rocks in January.

Metopa alderi, Spence Bate.

In tow-nets in June.

Liljeborgia zetlandica, Spence Bate.

Occasionally.

Dulichia porrecta, Spence Bate.

Not common.

Parathemisto oblivia, Kröyer.

It swarms at the surface in winter.

Cheirocratus sundevalli, Rathke.

Occasionally.

Amphilochoides pusillus, G. O. Sars.

Occasionally.

**Cerapus difformis*, M. Ed.

It makes remarkable processes, often 5$\frac{5}{8}$ in. long, on *Tubularia indivisa*[†], on which it perches itself at or near the tip.

[†] Ann. & Mag. Nat. Hist. ser. 5, vol. xvi. p. 484 (1885).

Pariambus typicus, Kröyer.

Occasionally abundant on *Asterias rubens.*

Phtisica marina, Slabber.

Midwater net in May.

Order Isopoda.

Idotea granulosa, H. Rathke.

Not uncommon on seaweed in tidal pools at West Rocks (*W. E. Collinge*).

Idotea neglecta, G. O. Sars.

Rather rare (*W. E. C.*).

Idotea viridis, Slabber.

Good specimens in pools on the West Rocks (*W. E. C.*).

Idotea pelagica, Leach.

Small examples. Rare (*W. E. C.*).

Idotea emarginata, O. Fabr.

Common (*W. E. C.*).

Idotea sarsi, Collinge.

On seaweed at West Rocks (*W. E. C.*).

Sphæroma serratum, O. Fabr.

In brackish pools at Eden (*R. M. Craig & W. E. C.*).

Gnathia maxillaris, Mont.

Parasitic, fixed at base of dorsal fin of young flounders.

Suborder **LEPTOSTRACA.**

Nebalia bipes, G. O. Sars.

Occasionally.

Suborder **CUMACEA.**

Cuma trispinosa, G. O. Sars.

Several in trawl in June.

**Diastylis rathkei*, Kröyer.

Many young occurred in bottom tow-net in February.

Order SCHIZOPODA†.

Thysanoessa longicaudata, Kröyer.

Occasionally in numbers.

Nyctiphanes norvegica, G. O. Sars.

In vast swarms, and occasionally (on 1st May, 1886) beached on the West sands like chaff.

Rhoda raschii, M. Sars.

Occasionally in great numbers off the mouth of the Bay.

Erythrops erythropthalmus, Goes.

Summer season.

Order DECAPODA.

Tribe **Paguridea.**

Family **Paguridæ.**

**Pagurus bernhardus*, L.

One in a botanic vasculum inserted itself under the gill-cover of *Cyclopterus* and made such its home.

**Lithodes maia*, Leach.

The pinkish eggs of a female captured in February hatched on the 11th March. The young have two apparently sessile eyes, a carapace which seems too large and has a projecting point at each side, with a wedge-shaped space between.

Munida bamffia, Pennant.

Procured in a crab-pot in the Bay.

Tribe **Macrura.**

**Homarus gammarus*, L.

A young example, 3⅝ in. long from spine to tail, was found after an easterly gale on the West sands. The longer claw was 2⅝ in., the shorter 1⅝, and the tail 2 in. It has been ascertained that in Canada such young forms occupy tubes and thus are rarely seen. In October 1901 the nets of the fishermen caught many lobsters off the East Rocks, some securing as many as ten, to the annoyance of the lobster men, who accused the others of taking their bread.

---

† For structural notes, *vide* ‘Scott. Naturalist,’ May–June 1919, p. 79.

Tribe **Brachyura.**

Portunus puber, L.

Rare. A male caught in the plaice-nets in November.

Portunus holsatus, O. Fabr.

Very destructive to the flounder and other nets in the Bay, where it abounds.

**Ebalia tuberosa*, Penn.

In the male the carapace is brownish red on the dorsum, and touches of red also occur on the chelæ and other parts.

**Cancer pagurus*, L.

A female procured on 26th February, 1903, carrying a mass of early ova of a bright cinnabar-red kept its chelæ doubled over them with the dactylopodite pressed amongst them, and made no effort to seize the fingers when touched. The late Dr. James R. Tosh described a peculiar example of July 1896, in which the right chela, while having the dactylopodite normal, had the tip of the propodite bluntly trifid, the dactylopodite biting between an outer process and an inner one.

It is curious that at Gairloch every crab is crushed, as the men only take lobsters, for which in 1894 they received 10*s*. a dozen.

A considerable destruction of edible crabs, from 3 in. across and upward, occurs with the cod- and flounder-nets.

Larval decapods eat larval mollusks, echinoderms, diatoms, and coccospheres (*Lebour*).

Suborder SCHIZOPODA.

Schistomysis ornata, G. O. Sars.

Near the mouth of the Bay. Occasionally.

Class PYCNOGONIDA.

. In this group eight occur at Plymouth, and only two are entered in the St. Andrews list.

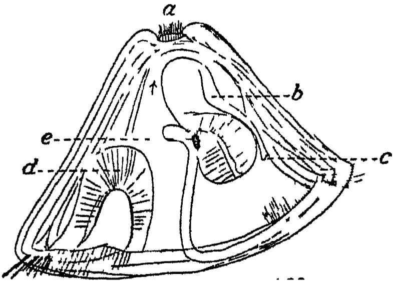
Class BRYOZOA †.

One hundred and four species of Bryozoa are included in the area at Plymouth, sixty-two at St. Andrews, and of these numbers thirty-seven are common to both areas. The species of *Crisia, Caberea, Tubulipora*, and *Stromatopora* are prominent in the south, along with *Amathia, Triticella,* and *Cylindræceum* ; whilst at St. Andrews *Cellaria farciminoides, Gemellaria loricata, Bugula purpurotincta, B. murrayana, Flustra foliacea, F. truncata, Lepralia reticulata, L. granifera, L. nitida,* and *L. annulata* are characteristic. Only the *Actinotrocha* stage of *Phoronis* has been found at St. Andrews. The Mediterranean is extremely rich in this group, and is also distinguished by its Terebratulids.

**Cellularia farciminoides,* Ellis & Solander.

This form, like certain Hydroids, grows with considerable rapidity, as for instance, on the bark of a submerged birch-tree, where it covered a large area of continuous and sound bark.

Text-fig. 37.



Text-fig. 37 *a*.

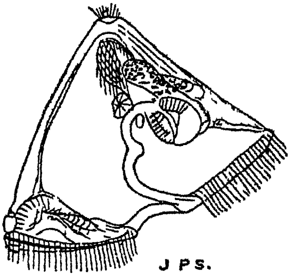


Fig. 37.—*Cyphonautes* as described in the text. Magnified.
Fig. 37 *a*.—An example showing the long cilia of the margin. Magnified.

---

† Journ. Mar. Biol. Assoc. iv. p. 171.

**Membranipora membranacea*, L.

The larval *Cyphonautes* abounds in the pelagic fauna of the Bay almost throughout the year, and is entered as from February to December.

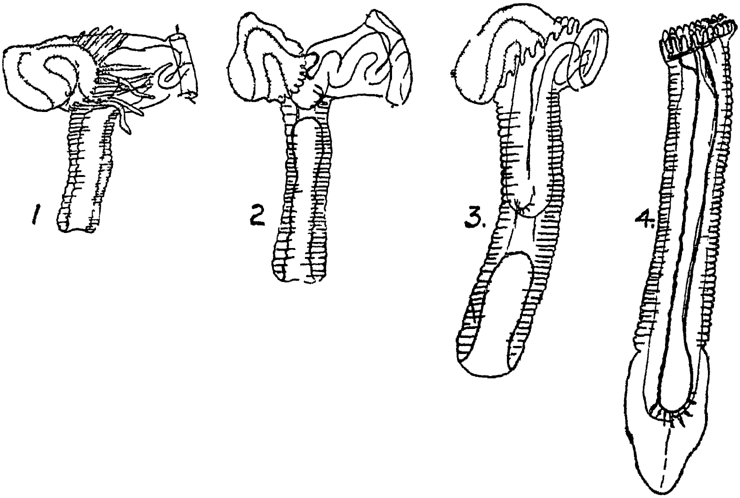
It devours diatoms (*Lebour*). The examples (text-figs. 37 & 37 *a*) figured by Mr. Pentland Smith, M.A., were procured at the surface in July. The ciliated aboral disc (*a*) has near it the musculo-neural tract of some authors. The ectoderm lines the valves of the shell. The mouth (following the arrow) leads to the stomach (*b*), the intestine terminating in the vent at *c* ; *d*, the pyriform organ with its cavity and vibratile tuft; *e*, adductor muscle of the valves ; the mantle lines the shell.

Genus PHORONIS.

Though the adults have never been captured in the Bay, the larval *Actinotrocha* (text-fig. 38), which Dr. Cobbold formerly found in the Forth, abounds in July and August, and has been specially studied by Prof. Meek and Dr. Masterman. It has been got as late as September at Plymouth, where Dr. Lebour found it fed on Peridinians and diatoms. Two species, viz. *Phoronis ovalis* and *P. hippocrepia*, were found by Dr. Strethill Wright in the Forth, and in all probability our form pertains to one of these. Both occur in shells, and Sir Sidney Harmer thinks they occupy the canals made by boring algæ. Early in 1884 a species swarmed in fragments of chalk sent by Mr. Shrubsole from S. England. Whether an alga had preceded the *Phoronis* in this case is unknown. The species found at Plymouth is *P. hippocrepia* and is classed by Prof. Garstang as a Gephyrean.

No marine form is more remarkable than *Phoronis* for beauty and life-history. The hooded larval form shows a series of finely coloured tentacles, which are richly ciliated, and an aperture at either end. It is carried gaily about in the water. When transformation is about to take place an inpushing appears at one side developing into a long coiled tube (text-fig. 38, 1 & 2), the animal still remaining pelagic and developing new tentacles at the base of the old. Then it becomes quiescent, sinks to the bottom, and suddenly the long internal tube begins to unroll like the turning of the finger of a glove inside out. The body, formerly so short, becomes elongated, and the mouth and vent, instead of being at opposite poles, are now brought near each other, whilst the stomach and alimentary canal slip into the long tube (text-fig. 38, 3 & 4). The hood and the central nervous system in it are absorbed (or swallowed ?), and hence the peculiar nature of that part of the nervous system which remains.

Text-fig. 38.



Metamorphosis of *Phoronis*; 1 & 2 show the earlier stages, 3 & 4 the later stages.

(Block kindly lent by Prof. Meek.)

Phylum **MOLLUSCA.**

The Pelecypoda are numerous in both localities, eighty-six being entered for Plymouth, seventy-three for St. Andrews, and fifty-three are common to both areas. *Mytilus modiolus* is absent in the south, where *M. barbata*, L., is present. *Gastrochæna*, *Pandora*, *Diplodonta*, *Cochlodesma*, *Gari*, and *Meretrix* are characteristic. The species of *Pholas* diverge as do those of *Thracia*, and *Lima hians* is absent from St. Andrews, the two species found there pertaining to deep water. Amongst characteristic forms at St. Andrews are *Crenella decussata*, Montagu, *Leda minuta*, O. F. M., *Lasæa rubra*, Mont., *Axinus flexuosus*, Mont., *Montacuta bidentata*, Mont., *M. ferruginea*, Mont., *Cyamium minutum*, Fabr., *Cardium norvegicum*, Spengler, *Astarte sulcata*, Da Costa. The species of *Modiolaria* and

Scrobicularia are more numerous; there are no Pulmonates; *Mya arenaria*, L., is common and *Xylophaga dorsalis*, Turton, occurs in submerged wood. A single Scaphopod (*Dentalium entalis*, L.) is present in both areas.

Most of the British Pelecypoda frequent the Mediterranean, which also is the home of the large *Pinna* and the boring *Lithodomus*.

The Prosobranchiates number seventy-seven at Plymouth, fifty-four at St. Andrews, twenty-five of which are common to both places. Southern types are *Fissurella*, *Monodonta*, *Calliostoma*, *Phasianella*, various Rissoidæ, *Ovula*, the Cerithiidæ, Scalidæ, *Cæcum*, *Ocinebra*, and *Mangilia*. At St. Andrews characteristic forms are *Tectura*, *Hydrobia*, *Homologyra*, certain Pyramellidæ, *Natica catena*, and *Nassa*; seventeen Tectibranchs occur at Plymouth, only eight at St. Andrews, seven being common to both. Southern types at Plymouth are *Haminea*, *Rocania*, *Colpodaspis*, *Pleurobranchus*, *Oscanius*, and *Runcina*. The Nudibranchs are especially prominent at Plymouth, no less than sixty-eight being entered, whilst the number found at St. Andrews is twenty-nine; about twenty are common to both regions. The number of southern types at Plymouth is considerable, including *Hermæa*, *Stiliger*, *Elysia*, *Æolidella*, *Berghia*, *Cythona*, *Carolina*, *Embletonia*, *Amphorina*, *Favorinus*, *Calma*, *Hero*, the Lomanotidæ, *Hancockia*, *Platydoris*, and *Lamellidoris*. *Eolis faranni*, Ald. & Hancock, *E. adelaidæ*, A. & H., and *Doris repanda*, A. & H., are characteristic of St. Andrews.

The Cephalopoda are few at St. Andrews, only five in number in contrast with eleven at Plymouth. The two common to both areas are *Loligo forbesii*, Steenstrup, and *Moschites* (*Eledone*) *cirrosa*, Lamk. The common form at St. Andrews is *Ommastrephes todarus*, Delle Chiaje.

The waters of the Mediterranean, again, are richer in the Aplysiidæ, *Tethys*, *Phyllirhoë*, *Haliotis*, *Turbo*, *Gibbula*, *Vermetus*, *Atlanta*, *Cymbulia*, and in the Cephalopods, besides having most of the British species.

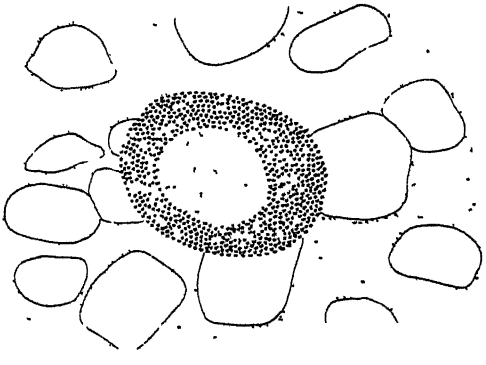
**Ostrea edulis*, L.

Various suggestions have been made as to the establishment of an oyster-bed at St. Andrews, but the single fact that the temperature is inimical disposes of the idea. Even those in the estuary of the Forth have undergone serious degeneration, chiefly from the ever-increasing impurity of the water. Those in October 1895 were thick-shelled and coloured green externally, many perforated by the boring sponge *Cliona*, and the animals shrunken and a few distorted. Altogether they were in an unsatisfactory condition. One, however, had well-developed ova. The native oysters from Whitstable also suffer much from *Cliona* and *Polydora*, the latter piercing the shell and causing blackish blotches and stains internally. It is difficult to see how any chemical substance applied to the exterior could be of service—from the risk to the oyster itself. The Whitstable beds likewise harbour on the oyster-shells *Eteone, Eulalia, Cirratulus, Dodecaceria, Pholoe*, Syllids, *Polycirrus*, etc.

**Mytilus edulis*, L.†

The pelagic young form an important element in the food of all kinds of young fishes in the Bay, and the supply to the older forms is continued after their attachment. The extensive beds of the estuary of the river Eden continue to be as fruitful as formerly under the trained staff of the Town Council. The mud collected by the masses of mussels beyond low-water mark raises the beds here and there several feet in the air, but after they are gathered the current soon lowers the surface to the normal level. The Fishery Board for Scotland, by the advice of Mr. Cumyn, attempted to increase the supply by establishing the "bouchot"-system in the Eden. Heavy larch-posts with wattles were erected in due form, but in a short time a severe storm swept the whole

Text-fig. 39.



Ovum of *Mytilus edulis* in the tissues. × 400 diam.

---

† E. W. D. Holt, Ann. & Mag. Nat. Hist. ser. 6, vol. viii. p. 184; Dr. John Wilson, "On the Development of the Mussel," 4th Rep. S. F. B.

erection into the Bay. The mussels spawn from January to July [†]. Pearls are not uncommon in them [‡]. An ovum in the tissues is shown in text-fig. 39.

Examples sent out a thread of mucus from the gut, containing diatoms, sponge-spicules, minute algæ, organic débris, sand, and mud. The young mussels usually appear in the bottom tow-nets at the beginning of June. The reproductive organs of examples from the West Coast of Scotland were well advanced at the end of January. This species is a commensal in the eye-sockets and on the swimmerets of the shore-crab, and on the gills of the haddock.

**Mytilus modiolus*, L.

The males are recognized by their pale reproductive organs, those of the female are dull orange. A hermaphrodite example has been seen [§]. Though the fishermen have often laid them down near the rocky border, none survived there. Rarely a stunted form has been found amongst the rocks.

**Modiolaria marmorata*, Forbes.

The ova are well developed in July.

**Montacuta bidentata*, Montagu.

The distinguished malacologist, Prof. Pelsener, of Brussels, has shown that this species is a commensal in various Lamellibranchs, such as *Pholas candida*, *Mya*, *Erycina*, etc., whilst others of the genus occur on *Phascolosoma* and *Phascolion*.

Montacuta substriata, Montagu.

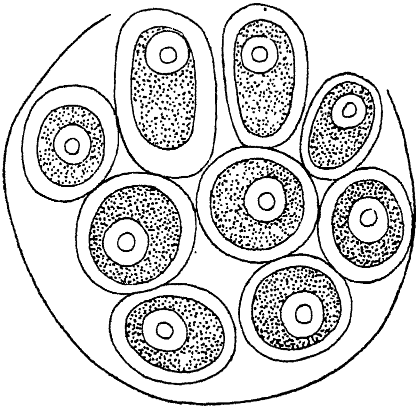
Abundant on *Spatangus purpureus* dredged off the Bell Rock.

**Cardium edule*.

On May 29th, 1891, the males had the sperm-sacs fairly developed, but no ripe sperms. In the females the ovisacs were distended, though the ova were not quite ripe (text-fig. 40). The nuclei were large and the nucleolus well marked as a clear round body. They would seem to spawn in June, probably later than the mussel.

[†] *Vide* Ann. & Mag. Nat. Hist., Dec. 1888, p. 467.
[‡] *Op. cit.*, June 1903.
[§] Ann. & Mag. Nat. Hist., Sept. 1894, p. 196.

Text-fig. 40.



Portion of the ovary of the cockle. × 360 diam.

**Cyprina islandica*, L.

In the beginning of November 1903, the West Sands were strewn with multitudes of this species, only few or no others being present. How they were dislodged by the storm without interference with others is a mystery. Large numbers were salted for bait and used with such success that on the great lines the fishermen in most of the boats got eight boxes of cod in the Bay. Prof. Cleland found *Malacobdella grossa* in it in April.

**Astarte sulcata*, Da Costa.

The ova in July were about $\frac{1}{100}$ inch in diameter.

**Astarte compressa*, Montagu.

Sperms (pale yellowish in mass) fully developed in July, the head being wedge-shaped.

Thracia convexa, Wood.

Procured by Dr. MacTier in numbers on the West Sands north of the Club-House.

**Saxicava rugosa*, L.

Specimens $\frac{4}{5}$ of an inch in July had minute ova $\frac{3}{1000}$ to $\frac{1}{500}$ of an inch and few in number.

**Pholas candida*, L.

Hundreds were strewn on the West Sands in a more or less perfect condition after the drainage blasting operations at the West Rocks, and were picked up by Dr. MacTier. Previously only single valves, as a rule, were obtained occasionally.

Teredo navalis, L.

Occasionally on floating timber.

Class GASTROPODA.

Trochus helicinus, O. Fabr.

Abundant on zoophytes and tangle-blades at and near extreme low water, Pier Rocks.

**Lamellaria perspicua*, L.

The *Atlanta*-like larva is not uncommon in June and July amongst the pelagic forms.

**Natica catena*, Da Costa.

A coil of ova was deposited by one the 17th of November.

**Buccinum undatum*, L.

The egg-capsules of the littoral examples are smaller than those in deep water, probably because the latter are larger animals. It is destructive to fishes on the lines, and is occasionally captured when so engaged by a hook.

Suborder **NUDIBRANCHIATA.**

Pleurophyllidia loveni, Bergh.

On haddock-lines near the mouth of the Bay in April (*E. W. Holt* †).

Idalia aspersa, Ald. & Hancock.

One occurred on 13th Oct., 1890. Procured also in the test of a broken *Molgula* from the fishing-boats in March (*E. W. Holt* †). This form is said to feed on Ascidians ‡.

**Tritonia hombergii*, Cuv.

A white variety from the Bell Rock was got by Mr. Holt †.

---

† Ann. & Mag. Nat. Hist. ser. 6, vol. viii. p. 184.

‡ Archiv Zool. Expér. no. 1, 1893.

Doris diaphana, Ald. & Hancock.

Occasionally at the East Rocks.

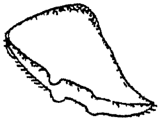
Class PTEROPODA.

Clione borealis, Pallas.

Captured occasionally in April, June, and July. The body is translucent, and from the anterior end a median bar of reddish orange goes backward behind the epipodia, which glisten with file-like marks, from the muscles. The tip of the tail is marked with reddish brown, which under the microscope is flecked with large pigment-cells. A small median process projects in front. The tentacles are pale. Two nuchal processes occur on the neck in front of the epipodia and a little median tentacle behind. The heart lies behind the orange region. Some show a small pale process at the tip of the tail. They swim actively and gracefully in the water.

Another form resembling *Clione* had a bifid anterior segment in front of the ring of cilia, each division having a rounded flat papilla with palpocils somewhat resembling *Pneumodermon*. There is a median as well as a caudal ring of cilia. When viewed from the dorsum the outline is symmetrical, but when turned round it presents two lamellar processes (apparently epipodia), with a structure like a tentacle behind. The central region is opaque whitish, not pink as in the previous form. It is about the same length. It differs from the larval *Dentalium* with its trifid anterior region, as carefully figured by Lacaze Duthiers †.

Text-fig. 41.



Unknown pelagic structure from the bottom tow-net in July. Magnified.

A minute pelagic form (text-fig. 41) from the bottom tow-net in July probably belongs to a known species which shows certain changes during development; whilst another represents a common type of veliger abounding towards the end of the year.

---

† Ann. Sci. Nat. (4) t. vi. & vii.

Spirialis retroversus, Mtrs.,=*Limacina trochiformis*, Gray.

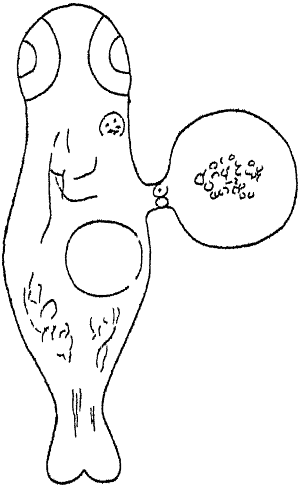
Many young forms in the nets in July, and occasionally earlier in the year.

Class CEPHALOPODA.

Loligo forbesii, Steenstrup.

For nearly a fortnight, along with *Eledone*, in November 1891 they caused serious injuries to fishes (cod, haddock, and whiting) on the lines, removing the muscles behind the head and 3 or 4 inches backward, whilst in others the brain is removed and the liver taken out, but the stomach and intestine are not interfered with. The rasp-like odontophore removes the muscles neatly, but shreds of skin hang to the wound. The fishes are useless for sale, but make bait for crab-pots. An extensive area from the Bell Rock to the Island of May and ten miles E. and W. was thus infested. The bottom-net on May 24th brought several young cuttlefishes (text-fig. 42) with yolk-mass attached. They were greedily devoured by *Hybochodon*. The egg-capsules had in all probability been ruptured in capture.

Text-fig. 42.



Young cuttlefish from the bottom-net in May. Magnified.

**Sepiola rondeletii*, Leach.

A male in June had numerous beautifully shaped spermatophores.

**Ommastrephes todarus*, Steenstrup.

A young example, 1 inch long, was procured in the bottom-net on the 8th March. A large cuttlefish, having a body about two feet long, was stranded on the East Rocks and was found by Mr. Andrew Brown, M.A. It was much destroyed by gulls, but, so far as can be observed, it is allied to *Stenoteuthis*. The ova of other forms are occasionally procured off the Bay as well as within it.

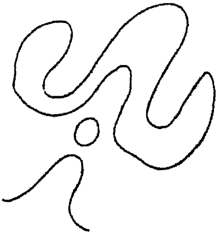
Subphylum **ENTEROPNEUSTA.**

Balanoglossus sp.

No adult has been seen, but the *Tornaria*-larva † is not infrequently captured, generally in August, and it has been studied by Prof. Meek and Mr. Holt. At Plymouth it occurs from August to September.

The larval *Tornaria krohnii* was procured at Plymouth by Prof. G. C. Bourne † in August and September, and he gives a detailed account of its structure.

Text-fig. 43.



The pre- and post-oral ciliated bands of *Tornaria*.
Sketched by Prof. Meek.

The fully-developed *Tornaria* (of 6th August, 1890) shows the apical sense-organ (pigment-spot), the inner loop of the pre-oral band, the median loop, the lateral loop of the longitudinal band, median loop of the longitudinal band (*more* Prof. C. G. Bourne), mouth, water vascular vesicle and pore, anus, mid-gut, hind-gut. Prof. Meek in text-fig. 43 gives an outline of the relation of the pre-oral and post-oral ciliated bands to the mouth.

---

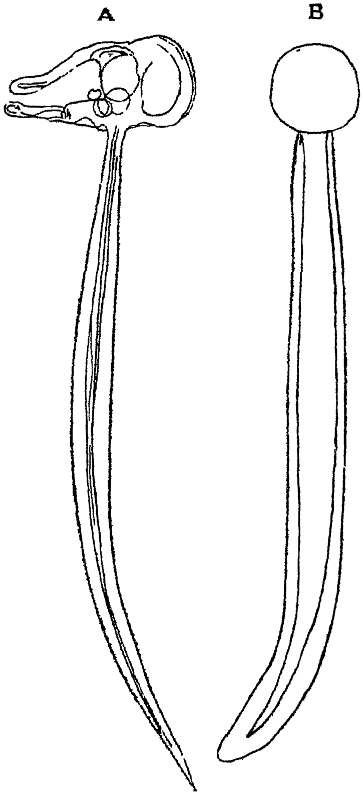
† Journ. Mar. Biol. Assoc. n. ser. vol. i. p. 63, pls. vii. & viii. (1889).

Subphylum **TUNICATA.**

Order ASCIDIÆ COPELATÆ.

Thirty-six species occur under the Tunicates at Plymouth, fifteen at St. Andrews, and only seven or eight are common to both. The southern species of *Molgula* differ, *Polycarpa* and *Corella*, *Diazona*, *Perophora*, *Distaplio*, *Archidostoma*, *Morchellia*, *Morchellioides*, *Fragrarium*, *Circinalium*, *Doliolum*, and *Salpa* are southern; whilst *Leptoclinum*, *Botrylloides*, *Parascidia*, and *Pelonaia* are northern. Many of the northern forms range to the Mediterranean, such types as *Eugyra*, *Ctenicella*, and *Rhodosoma* are apparently southern, as also are *Scarobotrylloides*, *Cystodytes*, *Distaplia*, *Fragrarium*, and others of the Composite series.

Text-fig. 44.

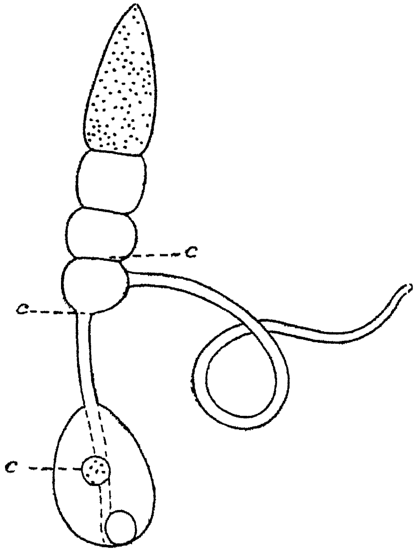


Lateral and end views of *Oikopleura*.

Oikopleura dioica, Fol.

Occurs in vast multitudes in the Bay (text-fig. 44), especially in May, so that the large midwater-net forming a triangle 10 feet along each side and 24 feet long could not be worked and anchored the boat. The fœcal pellets seemed to be algoid, consisting of diatoms, greenish granular matter, a few fragments of *Rhizosolenia*, and yellowish grains. It probably also feeds on the peculiar algoid bodies described in the Report of the Fishery Board †. *Oikopleura* often occurs at the surface or in 4, 6, and 8 fathoms along with ephyræ of *Aurelia*, small forms of *Thaumantias*, *Aglantha*, *Lestrigonus*, and small flounders. Once 2 fathoms of the surface-region was held by dense masses of *Rhizosolenia*, whilst *Oikopleura* swarmed in the region below. It is often eaten by Medusæ. Amongst those captured in February 1891, the accompanying form (text-fig. 45) occurred. The pointed anterior end is granular and is followed by three segments, the third having a long filament attached to its lateral region, whilst it is continued posteriorly by a narrow

Text-fig. 45.



Peculiar form amongst crowds of *Oikopleuræ* in February.

---

† S. F. B. 7th Rep. p. 271, pl. v. figs. 1–4.

process into a flattened ovoid body with a central ciliated structure. In the sketch *c* indicates where cilia existed. The exact nature of this larval form has not yet been determined.

At Plymouth *Salpa* and *Doliolum* are not uncommon, whereas these never appear at St. Andrews, and the same may be said of *Phoronis*, only the larva of which occurs at St. Andrews. *Oikopleura*, again, abounds in June and July.

Order ASCIDIÆ SIMPLICES.

Molgula impura, ? Hellier.

This form resembles a strawberry. West Sands after a storm (*E. M.*).

FISHES.

Subclass I. LEPTOCARDII.

A re-examination of the fragments found in the stomach of a cod makes the entry of *Branchiostoma lanceolatum*, Pall., uncertain. It is, therefore, removed from the list.

Subclass II. CYCLOSTOMATA.

**Petromyzon marinus*, L.

The ova were sent by Dr. Fulton on 19th March, 1892. They measured ·7620 × ·6096 mm. Nowhere are the adults so well seen as at Galway Bridge attached to stones.

**Myxine glutinosa*, L.

In 1884–5 this form was frequently found in the harbour alive, the hook being fixed far backward, and the "snood" (hair-line) projecting from the mouth. They were procured by the fishermen at the "Eel-hole" 8–10 miles off St. Abb's Head. Another site is east of the Isle of St. May. Both are muddy. The men dislike to touch them as the mucus clings tenaciously to the hands, so they break the "snood" and throw them overboard. Some had large ova, others small, in July. During the Trawling Expeditions, the skins and skeletons of Green Cod and Cod were sometimes drawn up, the muscles and other parts having been removed by *Myxine*.

Subclass III. TELEOSTEI.

Order ACANTHOPTERYGII.

Family **Percidæ.**

Labrax lupus, Cuv. The Bass.

A large example, weighing about 7 lbs. and measuring 2 feet 2 inches, was captured in the salmon stake-nets off the eastern rocks, and a smaller in a sweep-net for the capture of sea-trout in the estuary of the Eden, and measuring 17 inches in length. This fish is said to be scarce in Scotland, and is seldom or never captured by the liners. Both occurred in the beginning of May.

**Cottus scorpius*, Bloch.

An example, attempting to swallow a herring longer than itself, is in the Museum.

**Gasterosteus spinachia*, L.

The interesting nests occur in pools not far from high-water mark at the Castle Rocks in May[†]. A nest has been found in the same pool for several years.

Cottus quadricornis, L.

A fine example was caught by a liner, and also got in the Trawling Expeditions in 1884.

**Trigla hirundo*, Bl.

On 18th July, 1888, the ovaries in one 19¾ in. long were enlarged, the best developed eggs measuring ·031 mm.

Sebastes norvegicus, O. F. M.

A specimen, 17 inches long, was caught in the nets 11th January, 1904.

**Lampris luna*, Retzius.

Though the example in the University Museum is labelled as from the Bay, such appears to be doubtful.

Gobius minutus, Gmel.

Common in the harbour and in the Bay.

[†] *Vide* Frontispiece by E. E. Prince, 'British Marine Food-Fishes,' McIntosh & Masterman, 1897.

Aphia pellucida, Nardo.

A young form in tow-net near the surface, 23rd July, 1903. Rare.

Crystallogobius nilssoni, Dub. & Kor.

Young in midwater-net off the Tay, 20th February, 1889.

**Cyclopterus lumpus*, Artedi.

Caught in great numbers in the salmon stake-nets both at the East rocks and West Sands. The nets have sometimes to be opened lest the masses should rupture them.

Family **Pediculati**.

**Lophius piscatorius*, L.

Long bands of the ova were entangled in the salmon stake-nets on the 10th July, 1891.

Family **Blenniidæ**.

**Anarrhichas lupus*, L. †.

Masses of the ova occur in the Bay in January, and perhaps might be found earlier. They were procured by the local trawlers in 1886. Young forms appear about the end of February.

**Blennius pholis*, L.

A female ‡ deposited ova in confinement. The ova have not hitherto been seen amongst the rocks, though the young are common in the rock-pools.

**Centronotus gunellus* §.

The masses of ova are found in March in cavities in the rocks, such as the holes of *Pholas*, the adult being coiled around them.

**Zoarces viviparus*, L.

The structure of the papillæ in the ovary is characteristic ||.

---

† Trans. Roy. Soc. Edinb. vol. xxxv. p. 874.

‡ Zeitsch. f. w. Zool. Bd. lxxxii. p. 38, Taf. 21, 1905.

§ Trans. Roy. Soc. Edin. vol. xxxv. p. 676; and Ann. & Mag. Nat. Hist., Oct. 1887, p. 302.

|| Ann. & Mag. Nat. Hist., June 1885, p. 430, pl. xvi.

Lumpenus lampetriformis †.

First found in British waters during the Trawling Expeditions in 1884. Specimens occur in the Bay.

**Regalecus glesne* ‡, Ascan. (=*R. banksii*).

A fine example was procured on the beach at the Tentsmuir in a fresh condition, and is mounted in the Museum of the University.

Mugil chelo, Cuv. §.

The stomach in an example (15½ in.) obtained in June was gizzard-like and contained mussels and sand.

Order ACANTHOPTERYGII PHARYNGOGNATHI.

Labrus mixtus, Fries & Ekstrom.

The young abound in the rock-pools in autumn. The remarks under *Lubrus maculatus* apply to this species.

Suborder **PHYSOSTOMI ABDOMINALES.**

Family **Scopelidæ.**

Maurolicus pennanti, Walb.

Occasionally in rock-pools, East Rocks—probably swept in by storms.

Suborder **ANACANTHINI.**

Family **Gadidæ.**

**Gadus callarias,* Cuv.

On the 8th February, 1892, a cod, 30 inches long, had on the left side an irregularity of the lateral line, for it bent down toward the middle in a V-shaped process, whilst a short patch occurred in front of the V and another behind—almost touching the V.

---

† F. Day, Proc. Zool. Soc. for 1884, p. 445, pl. xli.; and 12th Rep. S. F. B. pl. iii. fig. 10.

‡ Ann. & Mag. Hist., Sept. 1902, p. 252. *Vide* also *ibid.*, July 1862, *R. Walker.*

§ 6th Rep. S. F. B. p. 276.

**Gadus æglefinus*, L.

On 16th March, 1892, a haddock, 2 feet long, had a large tumour 7 inches from the tip of the tail †. The fish was considerably atrophied, and the tail on both sides behind the tumour was congested—the colour being that of a red mullet. It was a female and the ovaries were ripening. The melanotic tumour presented an ulcerated surface, and microscopically showed a multitude of small cells with fibroid streaks between them. The liver was small and pale.

Gadus esmarki, Nilsson.

Occasionally in the Bay.

**Gadus virens*, L.

Active adults, apparently in their rush after prey, occasionally land themselves out of the water on the sand.

**Molva vulgaris* ‡, Flem.

A young ling of 3 inches was found alive in the sand at low water, and it had a single lateral band on each side. On the other hand, those of 5–8 inches which are procured off the rocky margins beyond the Pier are boldly barred on the sides. When they reach 18 inches no trace of the bars occurs. Dr. Schmidt therefore considers the barred forms as representing the Blue Ling (*M. byrkelange*), which, however, has never been obtained in British waters. In this connection two examples caught on May 21st, 1907, and measuring respectively 9½ and 13½ inches, are interesting. The former had the usual blotches or bars along the sides as described on p. 281 of the 'British Food Fishes.' The pectorals were still golden, the ventrals were pale with white trifid tips. The barbel had blackish pigment. The colour of the dorsal and caudal fins was as noted in the book referred to. In the larger example, the chief changes are the elongation of the snout in front of the eyes, the increase of the space between the eye and the nostril, and also an increase between the nostrils and the tip of the snout. The coloration is still like that of the younger specimen. The median division of the tip of the ventrals is longer and broader. The tail shows the pigment bars less boldly, though the margin is still white. The inner whitish curve is rather less.

---

† 10th Rep. S. F. B. pl. xvii. fig. 1.

‡ Ann. & Mag. Nat. Hist., January 1906.

Merlucius vulgaris, Flem. Hake.

Fine examples, 3 feet long, are occasionally caught in the Bay in March.

Phycis blennioides, Brün. Greater Fork-Beard.

An example, 2 feet long, was procured in March. It is occasionally caught in the Bay.

Motella tricirrata, Bl.

A fine example in the University Museum, about 18 inches long, was caught in the Bay in 1924.

Suborder **PLEURONECTOIDEI.**

Hippoglossoides limandoides, Bloch. Long Rough Dab.

Common in the Bay.

**Rhombus maximus*, Will.

No less than about a dozen turbot, deeply coloured on both sides, were procured in the nets for plaice in 1902. All had a deep notch in the skull anteriorly, so that the dorsal fin arose from a peak. The eyes were on the left side, the right eye being close to the margin. The right side had a few prickles. The length of the examples ranged from 9 to 14 inches †.

Zeugopterus punctatus, Bl.

Occasionally in the eastern part of the Bay. One stranded after a storm in January measured 72 mm.

Zeugopterus novegicus, Gthr.

A specimen, 84 mm. long, tossed on the East Sands after a storm in January 1895.

**Pleuronectes platessa*, L.

Parti-coloured plaice are not uncommon, and some have tumours.

---

† Ann. & Mag. Nat. Hist., April & Sept. 1902. *Vide* the same for plaice and other Pleuronectids; *vide* also for tumour on plaice, *ibid.*, May 1908; and for abnormal fins, *ibid.*, Dec. 1908.

**Solea lutea*, Bp.

This is referred to in the former list as *S. minuta*.

Suborder **PHYSOSTOMI ABDOMINALES.**

**Salmo trutta*, L.

After the sewage-pipe from the city was laid (the discharge being at the West Rocks) salmon-trout were observed to be more numerous at that part.

Family **Scomberesocidæ.**

**Belone vulgaris*, Flem.

An angler at Guard Bridge was much astonished at the capture of a fine example there, and thinking it was a kind of snake wrapped it carefully up and brought it to St. Andrews.

Scomber scomber, L.

A large mackerel is occasionally thrown on the East Sands in February, but it is a rare fish at St. Andrews, especially at that season.

Thynnus thynnus, L. †.

An old male weighing about 6 cwt. was caught in the neighbourhood in October 1885. The gills had tufts of *Obelia* and parasites on them.

Caranx trachurus, Cuv. & Val.

An occasional visitor. Caught in the sprat-nets near the mouth of the Tay.

Family **Clupeidæ.**

**Clupea harengus*, L.

It was not known that the herrings spawned in the Bay until the bottom-nets of the Laboratory found the entire Bay peopled with larval herrings, like fragments of thread, in March.

---

† Rep. S. B. (4th) p. 206, Appendix.

Suborder PHYSOSTOMI APODES.

Muræna helena, L.

An example was caught in a sprat-net near the mouth of the Tay, January 1901.

**Anguilla vulgaris*, Turt.

The metamorphosed young are occasionally found in the sand at low water. *Leptocephali* from the neighbourhood of the Bay were given to Dr. Gunther for the British Museum in. 1867.

**Conger vulgaris*, Cuv.

During very severe frosts (as in January and February 1886) large examples (4–5 feet long) were thrown on the East Sands. Apparently extreme cold is inimical in comparatively shallow water.

Order LOPHOBRANCHII.

Nerophis ophidium, L.

Not infrequent.

Subclass GANOIDEI.

Order CHONDROSTEI.

**Acipenser sturio*, L.

Most of the specimens caught in the Bay have been young, though in October 1904 one was 5 feet 8 inches long.

Order PLAGIOSTOMI.

**Galeus vulgaris*, Flem.

The majority of the examples seem to have been obtained in October and November. On November 2nd a female of 5 feet had a good-sized cod in its stomach, devoid of the head (which they are said to bite off), and a few small stones, to which anemones may have been fixed. The ovary contained large ova, about 2 inches in diameter, arranged roughly in three rows. They would soon be ready to enter the oviduct. The bilobed liver was greyish.

Lamna cornubica, Flem.

Of late years when the fishermen put nets for plaice and other fishes in the Bay, this shark has frequently been caught—sometimes as many as thirty or more in a season (October to December). Where lines are set they seem to pass along the series and bite the snoods, which they swallow with the haddocks. Some of the females are 9 feet in length and of a wide girth. Since the pyloric opening only admits a crow-quill, bones and coarse débris must be got rid of otherwise. The total length of the alimentary canal from the œsophageal opening to the vent in a female of 7 feet 3 inches was 4 feet, the large intestine was only 16 inches. They often roll the trammel-nets round their bodies in their struggles, and some are dead when discovered. The teeth of this species are sharp and long, and inflict deep wounds on their larger prey. They have never been known to attack the human subject. One example had a gaping aperture in the hyoidean region, probably caused by the tearing outward of a large hook †.

**Acanthias vulgaris*, Risso.

A large female had a hook about 3 inches long projecting through the pericardium, and on examination the heart was still pulsating regularly, the point of the hook touching the ventricle at each contraction, and the surface of the pericardium was covered with a purulent coating; yet the stomach of the fish contained several haddocks, and the animal was well nourished.

Alopecias vulpes, Bp. ‡.

A fine example measuring 14 feet from tip to tip was caught in a trawl off the Bay, and its muscles formed a dinner for the students and others. It tasted like lobster. Its stomach was filled with "green bones" (*Belone vulgaris*).

Suborder **BATOIDEI.**

**Raia clavata*, L.

The spawning-period seems to be extended, most of the eggs cast on the West Sands (north end) after storms being of various stages in November, some early, others advanced with the external gills, and one example deposited two capsules in March. The oldest fisherman knew no change in this species as regards distribution inside low-water mark.

---

† Ann. & Mag. Nat. Hist., Sept. 1907, p. 169, pl. xvii.

‡ *Op. cit.*, Sept. 1902, p. 255.

**Raia batis*, L.

A huge example from the Bay is in the University Museum, measuring about 7 feet antero-posteriorly and 5 feet across the body.

Trygon pastinaca, Cuv.

A fully-developed female was caught in the salmon stake-nets on 15th July, 1893. The figure in Day's 'Fishes' is indifferent, and does not show the correct outline of the anterior region—indeed, it is generally defective. The fish is thick.

THE MARINE BIRDS OF ST. ANDREWS †.

Order PELECANIFORMES.

Family **Phalacrocoracidæ.**

Phalacrocorax carbo, L. Cormorant.

Not uncommon.

Phalacrocorax aristotelis, L. Shag.

Not uncommon.

Family **Sulidæ.**

Sula bassana, L. Gannet.

Common at sea and occasionally close inshore.

Order ANSERIFORMES.

Family **Anatidæ.**

Anser anser, L. Grey Lag-Goose.

Winter visitor.

---

† I am much indebted to the talented ornithologists, Misses E. V. Baxter, F.L.S., and L. J. Rintoul, F.L.S., for revising this list and adding species and information.

Anser brachyrhynchus, Baillon. Pink-footed Goose.

Winter visitor.

Branta bernicla, L. Brent-Goose.

Winter visitor.

Branta leucopsis, Bechstein. Barnacle-Goose.

Rare.

Cygnus cygnus, L. Whooper-Swan.

Occasional winter visitor.

Cygnus bewickii, Yarrell. Bewick's Swan.

Rare.

Tadorna tadorna, L. Common Sheld-Duck.

Common. Breeds in rabbits' holes on Tentsmuir.

Anas platyrhyncha, L. Mallard.

Common in winter. Eighty years ago it used to frequent the fields within a few miles of St. Andrews, occasionally in such numbers that six have been brought down by a single shot.

Querquedula crecca, Teal.

Common.

Anas strepera, L. Gadwall.

Rare.

Mareca penelope, L. Widgeon.

Abundant in winter.

Mareca americana. American Widgeon.

One occasionally.

Spatula clypeata, L. Shoveller.

Rare.

Dafila acuta, L. Pintail.

Winter visitor in the estuary of the Eden.

Nyroca ferina, L. Pochard.

Not uncommon.

Nyroca marila, L. Scaup.

Common winter visitor.

Glaucionetta clangula, L. Golden-Eye.

Occasionally at the East Rocks in winter.

Clangula hyemalis, L. Long-tailed Duck.

Winter visitor.

Somateria mollissima, L. Eider-Duck.

Common in the estuary of the Eden and in small groups off the rocks. Is much more common than forty years ago. Breeds on Tentsmuir.

Somateria spectabilis, L. King-Eider.

Estuary of the Eden. Rare.

Melanitta nigra, L. Common Scoter.

Common winter visitor.

Melanitta fusca, L. Velvet Scoter.

Winter visitor.

Mergus merganser, L. Goosander.

Winter visitor in small numbers.

Mergus serrator, L. Red-breasted Merganser.

Occasionally.

Mergellus albellus, L. Smew.

One record from the Eden, 1837.

Order ARDEIFORMES.

Family **Ardeidæ.**

Ardea cinerea, L. Heron.

Common. Twenty-four herons have been counted fishing in the Eden between Guard Bridge and the Links. A heronry has been formed at Strathtyrum since 1880.

Order CHARADRIIFORMES.

Family Œdicnemidæ.

Œdicnemus œdicnemus, L. Stone-Curlew.
Rare.

Family Charadriidæ.

Scolopax rusticola, L. Woodcock.
Occasionally.

Capella gallinago, L. Common Snipe.
Winter visitor.

Capella media, Latham. Great Snipe.
Occasionally.

Lymnocryptes minimus, Brünnich. Jack-Snipe.
Occurs late autumn.

Calidris canutus, L. Knot.
Winter visitor.

Erolia minuta, Leisler. Little Stint.
Occasional passage-migrant.

Erolia maritima, Brünnich. Purple Sandpiper.
Winter visitor.

Erolia alpina, L. Dunlin.
Winter visitor, though some breed.

Erolia testacea, Pallas. Curlew-Sandpiper.
Occasional passage-migrant.

Crocethia alba, Pallas. Sanderling.
Passage-migrant.

Philomachus pugnax, L. Ruff.
Not common.

Tringa totanus, L. Redshank.

Common from autumn to spring. Breeds on Tentsmuir, and also inland (Forfarshire).

Tringa nebularia, Gunnerus. Greenshank.

Passage-migrant.

Tringa hypoleucos, L. Common Sandpiper.

Occurs on passage.

Tringa ochropus, L. Green Sandpiper.

Occasionally.

Limosa limosa, L. Black-tailed Godwit.

Occasionally.

Limosa lapponica, L. Bar-tailed Godwit.

Winter-visitor and passage-migrant.

Numenius arquata, L. Curlew.

Frequent in autumn and winter. Breeds on Tentsmuir and inland (Forfarshire &c.).

Numenius phæopus, L. Whimbrel.

Passage-migrant.

Pluvialis apricarius, L. Golden Plover.

Common in autumn and winter. Breeds on Tentsmuir and inland.

Squatarola squatarola, L. Grey Plover.

Passage-migrant. Winter visitor in small numbers.

Charadrius hiaticula, L. Ringed Plover.

Resident. Breeds on Tentsmuir. Also winter-visitor.

Vanellus vanellus, L. Lapwing.

Resident. Also winter-visitor.

Hæmatopus ostralegus, L. Oyster-catcher.

Estuary of the Eden, where mussels abound, except in the breeding-season.

Order LARIFORMES.

Family **Laridæ.**

Larus canus, L. Common Gull.

Abundant. These in large flocks now pass far inland, where formerly none were seen, and they eat corn.

Larus argentatus, Pontoppidan. Herring-Gull.

Common.

Larus marinus, L. Greater Black-backed Gull.

Chiefly winter-visitor.

Larus fuscus, L. Lesser Black-backed Gull.

Passage-migrant.

Larus hyperboreus, Gunnerus. Glaucous Gull.

Scarce winter-visitor.

Larus ridibundus, L. Black-headed Gull.

Very common. Breeds on Tentsmuir.

Larus minutus, Pallas. Little Gull.

Occasionally got.

Rissa tridactyla, L. Kittiwake.

Sometimes seen.

Sterna hirundo, L. Common Tern.

Abundant as summer-visitor. Breeds on Tentsmuir.

Sterna macrura, Naumann. Arctic Tern.

Uncommon. A few breed on Tentsmuir.

Sterna sandvicensis, Latham. Sandwich-Tern.

Passage-migrant.

Sterna albifrons, Pallas. Little Tern.

Summer-visitor. Breeds.

Catharacta skua, Brünnich. Great Skua.

Occasionally.

Stercorarius parasiticus, L. Richardson's Skua.

Occasionally.

Stercorarius pomarinus, Temminck. Pomatorrhine Skua.

Passage-migrant. Occasionally.

Order ALCIFORMES.

Family **Alcidæ**.

Alca torda, L. Razorbill.

Frequent. A large example in the Museum (before 1917) was supposed to be a hybrid between this and the Great Auk.

Uria aalage, Pontoppidan. Northern Guillemot.

Common.

Uria grylle, L. Black Guillemot.

Not uncommon.

Alle alle, L. Little Auk.

Winter-visitor—sometimes in large numbers.

Fratercula arctica, C. L. Brehm. Puffin.

Occasionally.

Order PROCELLARIIFORMES.

Family **Thalassidromidæ**.

Thalassidroma pelagica, L.

After a storm an example was picked up on the West Sands (*E. M.*).

Puffinus puffinus, Brünnich. Manx Shearwater.

Occasionally.

Puffinus gravis, O'Reilly. Great Shearwater.

Sternum found on West Sands, 9 Sept., 1881 (*E. V. B.*).

Fulmarus glacialis. Fulmar Petrel.

Occasionally.

Order COLYMBIFORMES.

Family **Colymbidæ.**

Colymbus arcticus, L. Black-throated Diver.

Occasional visitor.

Colymbus immer, Brünnich. Great Northern Diver.

Occasionally during winter. A fine male was captured, whilst diving, in the salmon stake-nets on the West Sands.

Colymbus stellatus, Pontoppidan. Red-throated Diver.

Common winter-visitor.

Order PODICIPIDIFORMES.

Family **Podicipidæ.**

Podiceps griseigena, Boddaert. Red-necked Grebe.

Very rare.

Podiceps auritus, L. Slavonian or Eared Grebe.

Occasional winter-visitor.

Podiceps ruficollis, Pallas. Little Grebe.

Occasionally.

MARINE MAMMALS.

Order CETACEA.

Suborder **ODONTOCETI.**

Phocæna communis, Lesson.

Common in the Bay, and often caught in the nets for plaice and cod. Occasionally in April an adult female would swim in small circles off the East Rocks accompanied by its young, or resting at the surface when the latter apparently was suckling. An albino example[†], about 4 feet long, was obtained in 1912, and the milk of a female was examined chemically by Prof. Purdie[‡].

A young female, 31½ inches long and 8½ inches across the flukes, was procured on June 12th, 1909. From each flipper a black stripe proceeded nearly to the angle of the mandible. No teeth had cut the gum. The dorsal fin was curved to the left side. The contents of the rectum were brownish and semi-fluid as in the child. The umbilical cord was barely 1 inch long and open, the probe passing readily into the abdominal region. Its walls were thin and could have been easily ruptured at this part. This was evidently a suckling porpoise and could not have been long free—in view of the condition of the dorsal fin and the flippers, which were not fully expanded.

Beluga ——?

A single example was seen close to the Gatty Marine Laboratory, and it went southward. It was captured near Cullercoats.

Orca gladiator, Gray.

A dead male was stranded on the East Sands, whilst an old female drifted near the old (wooden) laboratory alive, apparently enfeebled by age, as the teeth were much worn. The skeletons of both are represented in the University Museum.

Globiocephalus melas, Trail.

Occasionally observed in the warmer months in the Bay, especially near the salmon stake-nets. One was stranded at the Marine Laboratory, but struggled free before it could be captured.

A brownish whale about 18 feet long (probably this species) was seen off the East Rocks, 14th June, 1898.

Delphinus delphis, L.

Groups of three to five have been seen now and then in summer, leaping out of water and splashing, as on 15th June, 1898.

[†] Ann. & Mag. Nat. Hist. ser. 8, vol. ix. p. 117.

[‡] *Op. cit.*, Dec. 1885, and 'Chemical News,' Oct. 1885.

Mesoplodon bidens†, Sowerby.

A living female specimen came on shore at the West Sands, having been struck probably by a spent shot on one flipper and thus crippled. Its skeleton, heart, &c., are in the University Museum, after a careful description of the former by Sir William Turner‡.

Suborder **MYSTACOCETI.**

Balænoptera acuto-rostrata, Fabr.

Occasionally seen in the Bay. An adult female was procured at Crail, and its skeleton is in the University Museum §, as well as a cast of a dissected flipper from the British Museum.

Balænoptera physalus, L.

An example, 64 feet long, was beached at the Whale Rock (East Rocks) in the early forties of last century. Only blades of its whalebone occur in the University Museum.

Order PINNIPEDIÆ.

Family **Phocidæ.**

Halichœrus grypus, Nilsson.

A young example was captured at the East Rocks, and was preserved by Mr. Thomas Walker, late Curator of the University Museum. It is now in the Perth Museum.

Phoca vitulina, L.

Frequently noticed in the Bay as well as in the estuaries of the Eden and the Tay, where its depredations on the salmon necessitate special measures. Young examples are occasionally caught in the cod- and plaice-nets.

† Ann. & Mag. Nat. Hist., Dec. 1908.

‡ Proc. Roy. Soc. Edin. vol. xxix. pp. 687–720, with 11 text-figs. (1910).

§ Jour. Zool. Research, May 1917, pp. 37–73, pls. i.–v.

XVIII.—*Rhizopoda and Heliozoa from British Columbia.*

By G. H. Wailes.

Descriptions of two new species of Rhizopoda and notes of the occurrence of fresh-water species in a marine habitat are the subject of this communication.

Class *SARCODINA.*

Subclass RHIZOPODA.

Family **Conchulina.**

Centropyxis stellata, sp. n. (Figs. a, b, c.)

Test large, light brown or colourless, circular in oral view, nearly hemispherical in side-view, height equal to about two-thirds of diameter; aperture 3–5-lobed, invaginated, about one-third the diameter of the test in width; test composed of irregularly shaped silicious plates, without protuberances; animal not observed.

Dimensions.—Diameter 335–400 μ; height 252–290 μ; aperture 115–155 μ in width.

Habitat.—Freshwater; spring and stream, Coulter Bay and lake between Coulter Bay and Squirrel Cove, Cortes Island, B.C.

This species was found May 1915, but was held over for description in the hope of observing the living animal; Coulter Bay was revisited in 1926, but no individuals were found.

The only member of this genus equalling it in size is a form described by Dr. Penard (4) as a variety (?) of *C. arcelloides* from Sierra Leone, which measured 330–380 μ in diameter, with height of about one-third the diameter; *C. arcelloides* measures 70–110 μ in diameter, and has a large, circular, invaginated aperture about half the diameter of the test in width.

Corythion acutum, sp. n. (Figs. g, h, i.)

Test small, colourless, elliptical, slightly flattened dorso-ventrally; fundus terminating in a short spine, aperture large, circular, everted, opening ventrally; test formed of circular or sub-circular plates, arranged more or less regularly in diagonal rows; animal not observed.

Dimensions.—Length 50–55 μ; breadth about 23 μ; thickness 20 μ; aperture 16 μ in diameter; spine 5 μ in length; plates of test 3 μ in diameter and 1·5 μ in thickness.

Habitat.—On the sea-beach, Camp Island, B.C.

Although found on the sea-shore, as described below, it is in all probability a fresh-water or moss-inhabiting species.

The only other species of this genus that bears spines is *C. dubium*, var. *spicata*, Penard, found in Australasia (3).

Order AMŒBINA.

Astramœba granulifera, Wailes.

Syn. *Amœba granulifera*, Wailes (8).
Dactylosphærium radiosum, var. *granuliferum*, Penard (2).

This species, from British Columbia, was described by me in this Magazine, July 1925 (8), as *Amœba granulifera*, with a note to the effect that it rightly should be included in Vejdovsky's genus *Astramœba*, and that *Dactylosphærium radiosum* should be placed in the same genus.

Since then, Professor A. A. Schaeffer (5) has divided the two genera, which now contain the following species :—

Genus DACTYLOSPHÆRIUM, Hertwig & Lesser, 1874.

Dactylosphærium polypodium (M. Schultze). (Type-species.)

Syn. *Amœba polypodia*, M. Schultze (1854).
Dactylosphærium vitreum, H. & L. (1874) (in part.).

Dactylosphærium acuum, Schaeffer (5).

Genus ASTRAMŒBA, Vejdovsky, 1881.

Astramœba radiosa (Ehrenb.), Vejdovsky. (Type-species.)

Syn. *Amœba radiosa*, Ehrenb. (1830).
Dactylosphærium radiosum, Butschli (1880).

Astramœba granulifera, Wailes.

Astramœba stella, Schaeffer (5).

Astramœba flagellipodia, Schaeffer (5).

For a full discussion of the synonomy of the above species, Schaeffer (5) should be consulted, and Cash and Hopkinson (1) for complete bibliographical references.

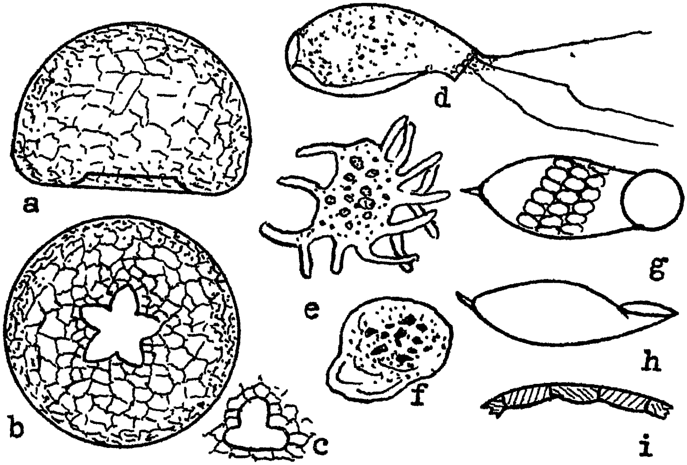
Genus STRIOLATUS, Schaeffer (5).

Striolatus tardus, Schaeffer (5). (Figs. e, f.)

An individual referable to this species was found on the sea-beach at Camp Island. Fig. e shows it active as first seen under the microscope, fig. f as in a contracted and perhaps abnormal state, owing to the evaporation of the sea-water under the slide.

S. tardus resembles the fresh-water species *Dactylosphærium polypodia*, but differs in having usually two nuclei instead of one.

In the individual observed, the nuclei were not distinguishable, but Schaeffer states that this is usually the case in the living animal ; the length was 50 μ over all when active, with a body-diameter of 30 μ.



Figs. **a**, **b**, **c**.—*Centropyxis stellata*, × 75.
Fig. **d**.—*Cyphoderia ampulla*, small form, × 500.
Figs. **e**, **f**.—*Striolatus tardus*, × 500.
Figs. **g**, **h**.—*Corythion acutum*, × 500.
Fig. **i**.—Ditto, section of test, × 2000.

FRESH-WATER RHIZOPODA IN A MARINE HABITAT.

Existing records of Freshwater-inhabiting Rhizopoda and Heliozoa living in the sea are few in number, and mostly refer to cases in which they were found either near the shore or in brackish estuaries, lagoons, etc. :—

Acanthocystis spinifera, Greeff, in the autumn often forms an important constituent of the neritic marine microplankton, occurring in great numbers ; on the west coast of Vancouver Island it occurs 7 miles off shore, but no evidence is at present available as to how far from land it extends, or to what extent it is tolerant of freshwater ; the freshwater form is fairly common in the lakes and pools, etc., throughout the coast-region of British Columbia.

Acanthocystis brevicirrhis, Perty, is not common in British Columbia freshwaters, and is scarce in the marine plankton, never occurring in numbers in any gathering yet collected.

Actinophrys sol, Ehrenb., has been recorded so far only near the shore, and no large individuals were seen, all being of small size.

Small forms that might be referred to this genus are met occasionally in association with *Acanthocystis spinifera* in the plankton, but seem more likely to be individuals of that species, which have not formed or have been accidentally deprived of their envelope and spines.

Cyphoderia ampulla (Ehrenb.). Several individuals of a very small form of this species were found on the beach of Camp Island in an active condition, with pseudopodia fully extended (fig. d).

They measured 45–49 μ in length with a diameter of 22–26 μ.

Euglypha lævis, Perty. Several individuals of this species were found on the Camp Island beach, living, but not active; length about 50 μ.

Empty tests of land or fresh-water Rhizopoda were almost entirely absent, only one each of a *Difflugia* and *Euglypha ciliata* being found.

Camp Island is a small island of about 70 acres in extent separated from Cortes Island by a pass about one-third of a mile in width, with strong tidal streams running through it.

There are no permanent streams or pools on Camp Island or a likely habitat for any species of Heliozoa or *Cyphoderia*, the latter a fresh-water genus which cannot resist dessication.

Euglypha lævis may have been carried down to the sea from mosses.

REFERENCES.

(1) CASH, J., and HOPKINSON, J. "The British Fresh-water Rhizopoda," Ray Soc. vols. i., ii. (1905, 1908).

(2) PENARD, Dr. E. 'Faune Rhizopodique du bassin du Leman.' Genève (1902).

(3) ——. In British Antarctic Exped. Report I, part vi. Rhiz., 1911.

(4) ——. "On some Rhizopoda from Sierra Leone." In Journ. Quekett Micro. Club. ser. 2, vol. xi. pp. 299–306, pls. ix., x. (1911).

(5) SCHAEFFER, ASA ARTHUR. "Taxonomy of the Amebas, with Descriptions of 39 new Marine and Fresh-water Species." Dep. Marine Biol. vol. xxiv. Carnegie Institute, Washington (1926).

(6) WAILES, G. H., and HOPKINSON, J. "British Fresh-water Rhizopoda and Heliozoa," vols. iii., iv., v. Ray Soc. (1915, 1918, 1921).

(7) WAILES, G. H. "Rhizopoda and Heliozoa from British Columbia." Contrib. to Canadian Biology. Biological Board of Canad. Univ. of Toronto Press (1925).

(8) ——. "Some new or rare Protozoa from British Columbia." Ann. & Mag. Nat. Hist. ser. 9, vol. xvi. pp. 40–48, pls. i. & ii. (July 1925).

XIX.—*The "Scrub Itch-Mite" of North Queensland: a new Species of* Trombicula. By Louis W. Sambon, M.D., Lecturer in the London School of Hygiene and Tropical Medicine.

A few weeks ago, the British Museum (Natural History) received from Mr. Frank H. Taylor, Entomologist in the Australian Institute of Tropical Medicine, Townsville, North Queensland, Australia, three specimens of a new species of Acarine affecting man. In a letter accompanying the specimens, Mr. Taylor stated that the mites forwarded for determination were known locally as "the Scrub Itch-Mite" and that "the irritation set up by these mites causes a dermatitis which is much more severe than an acute attack of prickly heat" . . . . "This mite is found in our 'scrub country' in damp situations, such as moist rotting logs, etc."

The "Scrub Itch-Mite" has been long known in North Queensland. In 1908, Mr. S. W. Jackson mentioned its attacks among the Tinaroo shrubs near Atherton. He wrote:—"November 2. The scrub itch-mites (*Leptus* sp.), tiny red parasites hardly visible to the naked eye, punished me severely again to-day; they mostly attack the legs below the knees, and quickly reduce them to a raw state of intense irritation, which was bad enough to make sleep quite impossible, and I found on inquiry that the aboriginals suffer to a similar degree."

In 1925, Mr. Stanley Hirst, until lately Acarologist in the British Museum, described under the name of *Leeuwenhœkia australiensis* an Australian species of "harvest-mite" which appears to be somewhat widely distributed in New South Wales. It is very troublesome to man, "causing intense irritation and actually burrowing into the skin." It manifests itself annually from October to April.

The North Australian mite, received from Mr. Taylor, is a species of *Trombicula* which I propose to call *Trombicula hirsti* in appreciation of the excellent work which Mr. Hirst produced whilst in the Museum—work chiefly of economic importance, accurately done and beautifully illustrated.

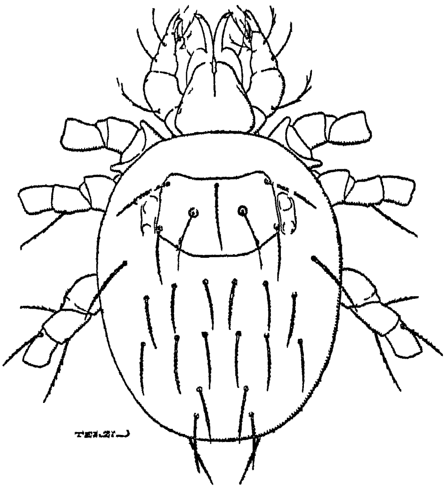
Trombicula hirsti, sp. n.

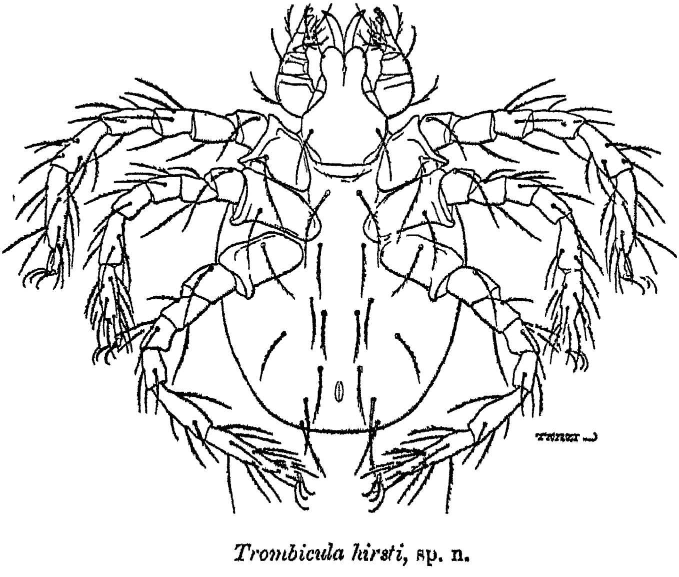
Larva (unengorged).

Dimensions.—*Length* 0·32 mm. ; *width* 0·21 mm.

Form of body.—Ovoidal, rather truncate at posterior end, widest portion on a level with space between second and third coxæ.

Fig. 1.



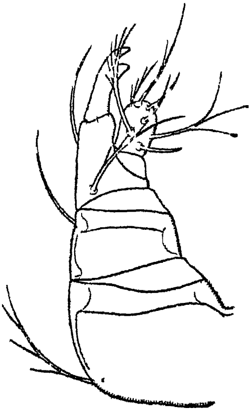


Trombicula hirsti, sp. n.

Fig. 1.—Dorsal aspect.
Fig. 2.—Ventral aspect.

Dorsal aspect (fig. 1).—*Dorsal shield* wider than long; anterior margin almost straight, somewhat convex in the middle; lateral margins slightly incavated posteriorly in correspondence with the adjacent anterior eyes; posterior margin strongly convex, middle third almost straight, lateral thirds bent towards anterior end. Corners rounded, anterior projecting forwards, posterior at junction of lateral margins with posterior margin. *Eyes* contiguous to dorsal shield. *Scutal setules* five in number, one at each corner and one at middle of anterior margin; all equally long and barbed. *Pseudostigmatic organs* slightly longer than scutal setules and branched along distal two-thirds. *Dorsal abdominal setules* twenty in number, arranged in five transverse rows as follows: 2.6.6.4.2.

Fig. 3.



Trombicula hirsti, sp. n. Palp.

Ventral aspect (fig. 2). — *Setules* sixteen in number, arranged as follows: 2 (one behind each first coxa), 2 (one behind each second coxa), 4 (rather close together and arranged in a curved transverse row), 2 (more laterally placed), 2 (anterior to anal opening), 2 (posterior to anus), 2 (further back), and 2 (at posterior body-margin). *Legs* of usual build. *Setules*—each coxa bears a single feathered setule; all other setules on legs feathered, save a few spine-like on dorsal aspect of tarsi of first and second legs. On tarsus of third pair a long nude sensory setule similar to the one found on the corresponding limb of *Trombicula autumnalis*.

Palpi (fig. 3).—*Setules*, one on dorsal surface of second palpal segment with three branches, one nude on third segment, two nude on fourth. *Palpal claw* bifurcate, outer prong longer, inner prong shorter but stouter. *Palpal thumb* with seven setules, the longer feathered, the others nude. *Chelicerœ* with a single, very minute, backwardly directed, tooth-like process at the apex.

Description and figures based upon three specimens collected from man at Townsville, North Queensland, Australia, by Mr. Frank H. Taylor. Type-slide in British Museum, Acarine Collection, No. 1927. 6. 20. 1.

Trombicula hirsti is a species very near *Trombicula wichmanni* described by Dr. Oudemans in 1905 from specimens collected in North Celebes by Professor Sarasin and in New Guinea by MM. de Beaufort and Lorentz. At first, I was inclined to look upon the Queensland wheal-mite as identical with that of New Guinea and Celebes, especially as many kinds of pigeons and other birds—its normal hosts—are common to New Guinea and to North Australia, but the specimens examined do not tally with the description and figures of *Trombicula wichmanni* published by Oudemans. They differ in the position of the eyes, the number and distribution of the body-setules, the branching of the palpal setules, and other details.

Trombicula wichmanni, like *Trombicula hirsti*, has been long known as the cause of a severely itching dermatosis. One of the first to mention it was the great naturalist Alfred Russel Wallace, who met it in the island of Ceram. He tells us in his book on the Malay Archipelago (vol. ii. p. 46) :—" I had suffered much from the irritating bites of an invisible acarus, which is worse than mosquitoes, ants, and every other pest, because it is impossible to guard against them. This last journey in the forest left me covered from head to foot with inflamed lumps, which, after my return to Amboyna, produced a serious disease, confining me to the house for nearly two months."

An interesting account of this particular acariasis is given by L. M. d'Albertis in his work on 'New Guinea: What I did and what I saw' (London, 1880, vol. ii. p. 34) :— " For some days past all on board have complained of a violent itching in different parts of the body, without finding out any cause for it, but to-day an almost microscopical insect was discovered, which has either attacked us in the forest, or has been carried on board in the skins of the gouras and other birds, which mostly live on land. I found that certain red lumps on the skin of these birds are actually formed of hundreds of these almost invisible creatures. The root of each feather becomes a pleasant abode for them. They must also possess immense productiveness—in fact, our bodies were entirely covered with them."

The two cousins, Professors Sarasin, collected the larvæ of *Trombicula wichmanni* on their own legs and on those of a native of North Celebes; they also collected them from the head of a Crowned Pigeon (*Goura* sp.), where hundreds were placed in regular rows "like cobble-stones in street pavements." This mite is called "Gonone" in North Celebes, but now the name Gonone is applied also to another Trombidiid larva which attacks man in New Guinea, the *Schongastia vandersandei*, described by Oudemans in 1905 from specimens collected by Dr. G. A. J. van der Sande in New Guinea, during the Dutch scientific expedition in 1903.

Trombicula hirsti may prove to be of considerable economic importance as a vector of "Mossman fever" (a local form of typhus) in North Queensland, just as *Trombicula akamushi* is a porter of "Japanese river fever" (also a form of typhus) in Hondo. Very likely the disease from which Wallace suffered in Amboyna was typhus contracted in Ceram through the agency of the local "scrub itch-mite," *Trombicula wichmanni*.

XX.—*The Heteromera and some other Families of Coleoptera from Polynesia collected on the 'St. George' Expedition,* 1925. By K. G. Blair, B.Sc., F.E.S.

(Published by permission of the Trustees of the British Museum.)

On the limited extent of the material here dealt with, a portion of one of the most extensive collections of insects ever made in these regions, it is not possible to draw full conclusions on questions of distribution and origin. It will, however, be evident that, apart from such cosmopolitan species as *Alphitobius lævigatus*, *Lyctus brunneus*, and *Necrobia rufipes*, the fauna, as here illustrated, is essentially one of wide distribution in the islands of the South Pacific. The range of one or two species extends westwards *viâ* Melanesia and Northern Australia into the Indian Ocean, but there is little evidence of Australian origin. The presence of the genus *Cyphogastra*, not unsupported by other evidence, is suggestive of a Papuan origin, by way of New Hebrides, Fiji, etc. An Indo-Malayan element, perhaps accidental, is represented by *Platydema subfascia*, while an interesting Central American element is afforded by such genera as *Sitophagus* and *Pachymerus*.

Another feature worth noting is the very little that has been added to the known fauna of the region since the early collections of Vesco described by Fairmaire, such additions as there are being for the most part either cosmopolitan species obviously introduced by commerce or the other foreign elements above noted. That these latter were present eighty years ago is evidenced by the appearance in Fairmaire's list of such genera as *Lagochirus* and *Cyllene* (*Clytus*). Whether these arrived in imported timber and other produce or by current-borne material should be ascertainable on fuller examination of the facts. At least, unlike the Papuan element, they appear to have undergone very little, if any, specific evolution since their introduction.

Family **Tenebrionidæ.**

Gebien, Coleop. Catal. Tenebr. (Junk, pars 28, 1911).

Platydema subfascia, Walk. Ann. & Mag. Nat. Hist. (3) ii. 1858, p. 284.

Society Is.: Tahiti, iii.–iv. 1925 (*Miss Cheesman*).

Originally described from Ceylon, this species has a wide Oriental distribution, the British Museum series comprising specimens from Japan, Tonkin, Singapore, Java, Borneo, Philippine Islands, and Honolulu. Its occurrence in Polynesia has not apparently hitherto been recorded; it was found in numbers with larvæ in a fungus.

Alphitobius lævigatus, F., Spec. Ins. i. 1781, p. 90; Blair, Ann. & Mag. Nat. Hist. (8) xiii. 1914, p. 486.

Alphitobius piceus, Ol. Geb. Cat. p. 405.
Heterophaga mauritanica, F., Fairm. Rev. Zool. 1849, p. 448.

Marquesas Is.: Nuka Hiva, 23. i. 25, one example at light on hillside, with grass and *Hibiscus*; Tahuata, 11. i. 25, three examples under bark of tree (*C. L. Collenette*).

A species of cosmopolitan distribution, usually occurring among old bones, hides, &c., frequently as a storehouse pest. Its occurrence under bark would appear to indicate that it had established itself upon some previous introduction, as it has been known to do elsewhere.

Sciophagus pandanicola, Boisd. Voy. Astrol. Ent. 1835, p. 258; Fairm. Rev. Zool. 1849, p. 446.

Chariotheca infima, Fairm. Ann. Soc. Ent. France, (6) i. 1881, p. 279.

Marquesas Is.: Tahuata, 12. i. 25, numerous examples under bark of tree (*C. L. Collenette*).

Society Is.: Raiatea (*Miss Cheesman*).

Widely distributed in the islands of the Pacific Ocean; the British Museum series contains specimens from Fiji, New Caledonia, Damma Is., and Hawaii.

Sitophagus hololeptoides, Cast. Hist. Nat. ii. 1840, p. 220.

Society Is.: Tahiti Valley, Ste. Amelie, 1000 feet, 16. iv. 25, one example (*Miss Cheesman*).

An introduced species originating from America, occurring principally in Mexico and the West Indies (Cuba, Hayti, etc.), but also found in Brazil. It has been recorded, as *Adelina farinaria*, Woll., from Madeira.

Family **Anthicidæ**.

Pic, Coleop. Catal. (Junk, pars 36, 1911).

Anthicus oceanicus, Laf. Monog. Anthic. 1848, p. 170; Fairm. Rev. Zool. 1849, p. 452.

Society Is.: N.E. Raiatea, sea-level, 22. v. 25, two examples (*Miss Cheesman*).

With type-locality Marquesas Is., the species has a wide oceanic distribution, being recorded from the New Hebrides, New Caledonia, and Honolulu in the Pacific, and from the Seychelles in the Indian Ocean. It was also found in Ceylon by the late G. Lewis.

The two examples before me differ from the typical form in having the head and thorax dark instead of bright red, and are, perhaps, referable to var. *francoisi*, Pic.

Family **Œdemeridæ**.

Schenkling, Coleopt. Catal. (Junk, pars 65, 1915).

Sessinia livida, F., Syst. Ent. 1775, p. 124 (*Lagria*).

Nacerdes livida, F., Fairm. Rev. Zool. 1849, p. 454.

Society Is.: Tahiti, at light, 1500 feet to sea-level, March 1925 (*C. L. Collenette*).

Society Is.: Raiatea, sea-level, May 1925 (*Miss Cheesman*).
Marquesas Is.: Nuka Hiva, at light, Jan. 1925, and Hiva Oa, Dec. 1924 (*C. L. Collenette*).
In the British Museum it is further represented from Henderson Is. to the east, and from Fiji, Samoa, and the Ellice Is. to the west.

Ananca decolor, Fairm. Rev. et Mag. Zool. 1849, p. 455 (*Nacerdes*).

Society Is.: Tahiti, at light, March 1925 (*C. L. Collenette*); Raiatea, May 1925; Bora Bora, June 1925 (*Miss Cheesman*).
Marquesas Is.: Hiva Oa, Dec. 1924; Nuka Hiva, Fatu Hiva, Tahuata, Jan. 1925 (*C. L. Collenette*).
Tuamotus: Fakarava, Feb. 1925.
Austral Is.: Rurutu, March 1925.
In British Museum also from Henderson Is., Rarotonga, and Fiji.
To M. Pierre Lesne, of the Muséum National d'Histoire Naturelle in Paris, I am indebted for kindly comparing a specimen with the type.

Ananca bicolor, Fairm. *loc. cit.* p. 456 (*Nacerdes*).

Society Is.: Tahiti, viii. 25; Raiatea, v. 25; Bora Bora, vi. 25 (*Miss Cheesman*).
Marquesas Is.: Hiva Oa, xii. 24; Nuka Hiva, i. 25.
Tuamotus: Fakarava, ii. 25 (*C. L. Collenette*).
In British Museum also from Rarotonga, Samoa, Ellice Is., and New Hebrides.

Ananca kanack, Fairm. *loc. cit.* p. 454 (*Nacerdes*).

Austral Islands: Rapa, at light, one example, 17. iv. 25 (*C. L. Collenette*).
Described from Tahiti, this species is not among the material collected there by the 'St. George' Expedition. Specimens from Tahiti are in the British Museum, with others from Fiji, the Solomon Is., New Caledonia, and Mysol.
The single specimen is not quite typical in puncturation; it has the eyes a little further apart than normally, and lacks the darker markings of the thorax, but in other respects it agrees so closely that I do not care to describe it as a distinct species.

PSELAPHANCA, gen. nov.

As *Ananca.* Mandibles bifid at apex.

♂. Maxillary palpi with last joint expanded, excavate on outer side towards apex ; fifth ventral segment widely emarginate at apex, sixth divided, fully exposed when withdrawn into cavity of elongate pygidium.

Type, *Selenopalpus lateritius,* Fairm.

Selenopalpus, White (type *cyaneus,* F.), is here regarded as restricted by Broun (Man. Coleopt. N. Zeal.) to forms of a blue-black colour, a stouter build, with thorax shorter, wider than the head, the eyes more oblique, and the hind femora and tibiæ in the male usually more or less modified, much as in many *Œdemera* spp.

The new genus, in its usually testaceous colour and bifid mandibles, more closely resembles *Ananca,* F. & G., but the latter has the palpi similar in the two sexes and the genitalia in the male concealed when at rest, thus rendering the sexes with difficulty recognizable.

Thelyphassa, Pasc. (type *diaphana,* Pasc.), as well as *Baculipalpus,* Broun, and *Dammarobius,* Broun, all have the palpi to a greater or less extent modified in the same way in the male, but all are limited to New Zealand. It is possible that some of the New Zealand species placed by Broun in the genus *Sessinia* *—e. g., *lineata,* F., and *strigipennis,* White—may come into *Pselaphanca,* having similarly modified palpi, but differing somewhat in the male genitalia.

Sel. caledonicus, Fauv. (New Caledonia), *Sessinia andrewsi,* Arrow (Christmas Is.), and *S. apicata,* Fairm., from Fiji and the Ellice Is. (Funafuti and Nui), must also be transferred to *Pselaphanca.*

Pselaphanca lateritia, Fairm. *loc. cit.* p. 257, pl. xi. fig. 5 (*Selenopalpus*).

Society Is.: Tahiti, sea-level to 2000 feet, March and April 1925 ; Raiatea, sea-level, May 1925 (*Miss Cheesman*).

The British Museum has it also from the island of Moorea and from Rarotonga.

---

* N.B.—*S. stictica,* Broun, and *S. brooksi,* Broun, on examination of the types, prove to be species introduced from Australia, viz., *Ananca nigronotata,* Boh., and *A. macleayi,* Champ., respectively.

Pselaphanca apicata, Fairm. Ann. Soc. Ent. France, (6) i. 1881, p. 288 (*Ananca*).

Tuamotus: Fakarava, 1 ♀ at light, Feb. 1925 (*C. L. Collenette*).

Described from Fiji; the British Museum has specimens from Samoa and the Ellice Is.

Pselaphanca australensis, sp. n.

Brownish testaceous, elytra rather broadly paler laterally; eyes rather widely separated, the distance between them about equal to that between the bases of the antennæ; thorax longer than wide, its greatest width about anterior third, disc rather densely and strongly punctate; elytra with suture and three costæ rather strongly raised, the external costa not far from margin, puncturation somewhat asperate and moderately coarse.

♂ with last joint of maxillary palpi strongly excavate on external side, the excavation about twice as long as the straight basal portion, apex convex, about as long as the excavation, the inner side short, scarcely longer than the basal portion of the outer side; abdomen with fifth ventral segment bi-emarginate at apex, the median lobe longer than the lateral lobes, the narrow bilobed sixth segment exposed.

Long. 7·5–10 mm.

Austral Islands: Rapa, at light, April 1925 (*C. L. Collenette*).

Similar to *P. lateritia*, Fairm., but smaller, the lateral portion of the elytra paler than the rest instead of darker, the eyes wider apart, puncturation coarser and the sexual characters of the ♂ different. In *P. lateritia* the fifth ventral segment has no median prolongation and the last segment of the palpi is rhombic in shape with the external apical side excised.

Family Ciidæ.

Cioidæ, Dalla Torre, Coleopt. Cat. (Junk, pars 30, 1911).

Cis collenettei, sp. n.

Robust, glabrous, moderately nitid, blackish piceous, with mouth-parts, funicle of antennæ, legs, and underside more or less testaceous. Supra-antennal lobes of head bluntly rounded, narrowly reflexed, not projecting when seen from above beyond the median part; frons convex, without median tubercle, rather finely and sparsely punctate, clypeus more coarsely and densely punctate. Thorax widest a little before base, reflexed lateral margins completely visible from above, anterior margin arcuate but sinuate before the anterior angles, so that these appear to project slightly forwards; disc finely and rather sparsely punctate. Elytra subovate, widest about middle, reflexed margin entirely visible from above, puncturation similar to that of thorax. Tibiæ not dentate at apex.

Length 2 mm.

Marquesas Is.: Hiva Oa, Jan. 1925, one example under bark of tree (*C. L. Collenette*).

The presence of a median tubercle on the first ventral segment indicates that the specimen is a male, but other external sexual characters appear to be lacking. In appearance the insect suggests *Octotemnus glabriculus*, Gyll., rather than *Cis*, but the generic characters are different. Perhaps allied to *Cis sublacernatus*, Scott, from the Seychelles, but stouter and more convex, with different puncturation and colouring. From *C. micros*, Fauvel, from New Caledonia, it differs in its larger size and more uniform coloration, as well, probably, as in shape.

Cis cheesmanæ, sp. n.

Elongate-ovate, glabrous, nitid, testaceous. Supra-antennal lobes of male well developed, forming broad flat plates rounded at apex; in the female they are narrow and only slightly prominent. Prothorax widest near base, sides rounded, with the reflexed border entirely visible from above, anterior margin arcuate, slightly emarginate before anterior angles; disc moderately strongly but not closely punctate. Elytra ovate, widest about middle, lateral margin visible from above for only a short distance behind shoulders; puncturation double, consisting of large rather shallow punctures, with indications of linear arrangement and fine scattered punctures between them. Anterior tibiæ with external apical angle acute, slightly produced.

♂. In addition to the supra-antennal plates above noted, there is a median frontal tubercle or raised pit, similar in structure to, though slightly smaller than, the median organ on the first ventral segment.

Length 1⅔–1¾ mm.

Marquesas Is.: Nuka Hiva, 1100 feet, 16. i. 25, 1 ♂, 2 ♀ ♀ in fungus; Hiva Oa, 1600 feet, 30. xii. 24, 1 ♀ in fungus (*C. L. Collenette*).

In the cephalic development of the male and in punctuation closely resembles *Cis pacificus*, Sharp, from Hawaii, but in the latter species the thorax is much more convex, concealing the lateral margins when viewed from above, and the elytra are almost parallel-sided for the greater part of their length, and more suddenly and obtusely rounded behind. There is a closely allied though smaller species in Samoa.

Cis marquesanus, sp. n.

Elongate, subparallel, finely and obscurely pubescent, testaceous or fusco-testaceous, with the mouth-parts, funiculus of antennæ, and the legs paler. Prothorax subparallel, the lateral borders reflexed, but when viewed from above concealed in front by the convexity of the thorax; disc moderately closely and strongly punctate, the intervals between the punctures finely reticulate. Elytra subparallel, lateral borders completely invisible from above, puncturation irregular, about as fine and as dense as that of thorax, each puncture bearing a short, fine, backwardly directed hair. Anterior tibiæ with the external apical angle acute, slightly produced; on the other tibiæ this angle is sharply rectangular.

♂. The supra-antennal lobes reflexed, not much wider than those of the ♀, obtusely angular near their inner limits; the usual median frontal tubercle and that on the first abdominal segment are present.

Length 1⅓ mm.

Marquesas Is.: Hiva Oa, 1600 feet, 30. i. 24, in fungus, 4 ♂ ♂, 1 ♀ (*C. L. Collenette*).

Very close to *C. retithorax*, Scott, from the Seychelles, but the puncturation, especially that of the elytra, is a little coarser and the pubescence more evident. In the Marquesas species the anterior margin of the thorax is more evenly arched, forming a continuous curve with the side-margin, while in *C. retithorax* the anterior angles, though obtuse, are evident, the anterior margin being distinctly sinuate towards the sides.

Family **Lyctidæ.**

Lyctus brunneus, Steph. Ill. Brit. Ent. Mandib. iii. 1830, p. 117, pl. xviii. fig. 4.

Society Is.: N.E. Raiatea, 22. v. 25, one example (*Miss Cheesman*).

The powder-post beetle, a well-known timber pest, now almost cosmopolitan in distribution.

Family **Bostrychidæ**.

Lesne, Revis. in Ann. Soc. Ent. France (1900).

Xylothrips religiosus, Boisd. Voy. Astrol. 1835, p. 460 (*Apate*).

Apate religiosæ, Fairm. Rev. Zool. 1850, p. 50.

Marquesas Is.: Hiva Oa and Fatu Hiva, at light in mango-grove, 27. xii. 24 and 6. i. 25 (*C. L. Collenette*).

Society Is.: Tahiti, at light, 1500–2000 feet, 16. iii. 25 and 30. iv. 25 (*C. L. Collenette*); Raiatea, 11. v. 25, and Bora Bora, 12. vi. 25 (*Miss Cheesman*).

Austral Is.: Rurutu, at light, 24. iii. 25 (*C. L. Collenette*).

Widely distributed amongst the islands of the South Pacific.

Tetrapriocera oceanina, Lesne, with type-locality Marquesas Is., was not found by the expedition.

Family **Cleridæ**.

Schenkling, Coleopt. Catal. (Junk, pars 23, 1910).

Cylidrus cyaneus, F., Mant. Ins. i. 1787, p. 126.

Cylidrus vescoi, Fairm. Rev. Zool. 1849, pp. 36, 361.

Society Is.: Raiatea, 23. v. 25, one example (*Miss Cheesman*).

A widely distributed species in the tropics of the Old World from Tahiti to Central Africa. It is reported to prey upon *Xylothrips*.

Necrobia rufipes, De G., Mem. v. 1775, p. 165, pl. xv. fig. 4.

Corynetes rufipes, F., Fairm. Rev. Zool. 1849, p. 362.

Easter Is., from carcase of bullock, 10. v. 25 (*C. L. Collenette*).

Society Is.: Tahiti, beaten from herbage, 2. iii. 25 (*C. L. Collenette*); in cheese, March 25 (*Miss Cheesman*); Raiatea, 24. v. 25 (*Miss Cheesman*).

Commonly known as the "copra beetle," this species is carried everywhere by commerce. Apart from copra it occurs frequently among hides, bones, etc., and in a great variety of stored merchandise, including cereals. In situations of the latter nature it is probably not noxious, but is predaceous upon other insects occurring as pests, and it is possible that even in copra it may really in part be preying upon dipterous and other larvæ. For the allied *N. ruficollis*, F., Dr. Hugh Scott concludes that the larvæ "are usually saprophagous, but that they sometimes return to the predaceous habits characteristic of the Cleridæ, and kill and devour other larvæ" (Annals of Applied Biol. vi. 1919, pp. 101–115).

Family **Buprestidæ.**

Obenberger, Coleopt. Cat. (Junk, pars 84, 1926) (incomplete).

Cyphogastra bedoci, Théry, Ann. Soc. Ent. Belg. lxvi. 1926, p. 73, fig. 3.

Marquesas Is.: Fatu Hiva, on banana, Jan. 1925, two examples (*C. L. Collenette*).

The species was described upon a single specimen from which the two examples now before me differ slightly in various particulars. The type was 25 mm. in length; the dimensions of the present examples are:—♂ 28, ♀ 35 mm. The colour is greenish brassy rather than "vert clair," with the lateral border fiery coppery. The underside of the ♂ is blackish bronze with rather dense silvery pubescence, of the ♀ purplish coppery, the legs in both cases, except the tarsi, concolorous. The tarsi are testaceous, with the claw-joint black.

The allied *Pleiona tayauti*, Guér., also native to the Marquesas Is., was not found by the members of the 'St. George' Expedition.

Cyphogastra taitina and *C. similis*, Kerr (1919), both from Tahiti, must be very close to, if not identical with, this species, but no *Cyphogastra* was met with on that island by the 'St. George' Expedition.

Agrilus indignus, Fairm. Rev. Zool. 1849, p. 353.

Marquesas Is.: Nuka Hiva, sea-level, Jan. 1925, on *Hibiscus* flowers; Hiva Oa, 3000–3500 feet, beaten from pepper, Jan. 1925 (*C. L. Collenette*).

Society Is.: Tahiti; Papeete, on yellow *Hibiscus*, 24. iii. 25; Papenoo, 300 feet, iii. 25; Hitiaa, 9. vii. 25; Tautira, 7. viii. 25;

N.E. Raiatea, sea-level, on *Hibiscus* leaves, 20–27. v. 25; S.E. Raiatea, Vallee Vaiurumai, 4. vi. 25 (*Miss Cheesman*).

Described from Tahiti, it occurs also in Samoa. Among the large series of specimens the very similar *A. humerosus*, Fairm., with a post-humeral carina on the elytra, was not detected.

Family Elateridæ.

Schenkling, Coleopt. Cat. (Junk, pars 80, 1925) (incomplete).

Adelocera modesta, Boisd. Voy. Astrol. 1835, p. 108.

Adelocera pruinosa and *squalida*, Fairm. Rev. Zool. 1849, p. 359.

Marquesas Is.: Hiva Oa, at light, Jan. 1925, two examples (*C. L. Collenette*).

Widely distributed in the tropics of the Old World, from Hawaii, throughout Oceania and Northern Australia, the Sunda Islands, India, Ceylon, Aden, Madagascar, Rodriguez, Seychelles, and Senegal.

Simodactylus cinnamomeus, Boisd. Voy. Astrol. 1835, p. 106.

Monocrepidius chazali, Le Guill. Rev. Zool. 1844, p. 220.
Monocrepidius subcastaneus, Fairm. Rev. Zool. 1849, p. 35.
Monocrepidius sericans, Fairm. Rev. Zool. 1849, p. 356.

Marquesas Is.: Nuka Hiva, beaten from ferns, 2500 feet, 20. i. 25; Hiva Oa, at light, sea-level to 1200 feet, i. 25; Fatu Hiva, at light, 2000 feet, 31. i. 25.

Tuamotus: Fakarava, at light, ii. 25 (*C. L. Collenette*).

Society Is.: Tahiti, Lake Vaihiria, in rotten wood, 19. vii. 25 (*Miss Cheesman*).

Another widely spread Pacific species, occurring in Hawaii, Fiji, New Hebrides, etc.

Monocrepidius pallipes, Eschsch., Thon, Ent. Arch. ii. 1, 1829, p. 31.

Monocrepidius rufangulus, Fairm. Rev. Zool. 1849, p. 355.

Society Is.: Tahiti, Papeete, 25. vii. 25; Bora Bora, sea-level, 11. vi. 25 (reef-islet, 14. vi.) (*Miss Cheesman*); Moorea, at light, 13. iii. 25 (*C. L. Collenette*).

Austral Is.: Ruiutu, on oleander flowers, 24. iii. 25 (*C. L. Collenette*).

The British Museum series exhibits specimens from Rarotonga, Fiji, New Hebrides, the Ellice Is., and the Gilbert Is.

Drasterius instabilis, Fairm. Rev. Zool. 1849, p. 357 (*Oophorus*).

Heteroderes instabilis, Fairm., Schwarz in Wytsman, Gen. Insect. Elat. (1906).

Society Is.: N. Raiatea, 1500 feet, 1. vi. 25, one example (*Miss Cheesman*).

Marquesas Is.: Fatu Hiva, 1000 feet, 8. i. 25; Hiva Oa, on pepper, 3000 feet, 27. i. 25, two examples (*C. L. Collenette*).

It is with some doubt that the short series before me is assigned to this species, which is known to me only from description. In many respects it accords well with the description, though the markings, admittedly variable, do not agree with those as described. One individual from Hiva Oa approaches more closely than the majority, being testaceous, with darker head and underside, and with a dark mark along the outer margin of the elytra, extending on to the disc a little before the middle. All the others are darker, the lateral dark mark more extensive and confluent near the middle and at the apex with a dark sutural streak, so that the elytra are better described as fuscous, each with a testaceous basal streak and a patch of the same colour beyond the middle. The thoracic puncturation is dense and fine, but not double; the tarsi simple, as long as the tibiæ.

If this identification is correct, the species is certainly not a *Heteroderes*, but should be placed with *Drasterius*, Eschsch., to which genus other species originally included in *Oophorus* have been assigned.

Psephus ænescens, sp. n.

Reddish piceous, nitid, the elytra moderately strongly greenish metallic with the suture reddish, the upper side with rather long but not very dense yellowish-grey pubescence. Head moderately coarsely but not densely punctate. Antennæ slender, nearly reaching the posterior coxæ, second joint small, third nearly equal to fourth. Prothorax finely and sparsely punctate, widest across basal angles, without median basal sulcus. Elytra widest at shoulders, finely striate-punctate, the punctures elongate; interstices flat towards slightly convex behind the middle, with few very Underside, with elytral epipleura, reddish

Le

Breadth

castaneous; the legs slightly paler, the coxal sheaths of posterior legs very bluntly angulate at inner third.

Length 8 mm.

Marquesas Is.: Fatu Hiva, one example at light, 300 feet, 6. i. 25 (*C. L. Collenette*).

Very near *P.* (*Ischiodontus*) *hawaiiensis*, Cand., which, however, is rather larger, lacking the metallic reflection on the elytra, more coarsely punctate, especially towards the sides of the pronotum, and with a distinct median basal sulcus. The tooth or angle on the posterior coxal sheaths in *P. hawaiiensis* is also much more pronounced than in the new species.

It is, perhaps, doubtful whether this insect should be placed in *Psephus* or in *Ischiodontus*, the two genera being scarcely separable. Schwarz, in Wytsman, 'Genera Insectorum,' retains *Ischiodontus*, with the exception of *I. hawaiiensis*, for American forms, *Psephus* for African and Oriental. Probably the new species, with *hawaiiensis*, would be more naturally placed with the Polynesian group of *Psephus*. Incidentally it may be noted that, through an unfortunate error in labelling, the name *hawaiiensis* is quite inappropriate, the species occurring in Samoa, not the Sandwich Islands.

Family Bruchidæ.

Pic, Coleopt. Catal. (Junk, pars 55, 1913).

Spermophagus insularum, sp. n.

Moderately elongate, subparallel, testaceous, more or less fuscous beneath, uniformly covered with a fairly dense decumbent fulvous pubescence.

Length 6, width 3 mm.

Marquesas Is.: Nuka Hiva, two examples at light, 300 feet, 22. i. 25; Tahuata, Jan. 1925, beaten in numbers from herbage (*C. L. Collenette*).

Closely allied to *S. robiniæ*, F., and more especially to *S. simulator*, J. du Val. From the former it differs in being immaculate, from the latter in the sides of the elytra being less rounded, thus making it appear more parallel-sided. The elytral pubescence is uniformly dense, without the thin spots characteristic of *S. simulator*, and the interstices are uniformly flat except that the third is slightly more convex shortly before it unites near the apex with the
of them is at all raised towards the base.

but little longer than wide, and rounded at the apex; in *S. simulator* it is acuminate and twice as long as its basal width.

S. insularum belongs to a group of species essentially Tropical American in distribution, and there can be little doubt but that it is a recent introduction with seed from that part of the world.

XXI.—Dyspterna woodi, *gen. et sp. n., a Carnivore from the Oligocene, Isle of Wight.* By A. TINDELL HOPWOOD, M.Sc., F.L.S.

(Published by permission of the Trustees of the British Museum.)

THE specimen here described was found by Mr. S. L. Wood in the Hempstead Beds of Yarmouth, Isle of Wight, and, with characteristic generosity, presented by him to the Geological Department of the British Museum. It is of great interest, for not only does it add a new carnivore to the list of forms found in those beds, but it represents a type of tooth-structure very rare, if not unique, among mammals.

DYSPTERNA, gen. nov.

Diagnosis.—A primitive carnivore with the second and third lower molars subequal in length; trigonid much compressed postero-anteriorly; paraconid greatly reduced; protoconid larger than metaconid; hypoconid very large; entoconid absent. Anterior cingulum well developed; postero-internal shelf with strongly defined limiting ridge.

Genotype:

Dyspterna woodi, sp. n.

Holotype.—Part of a left mandibular ramus containing the second and third molars. Registered M 13125, Brit. Mus., Geol. Dept.

Horizon.—Hempstead Beds, Lower Oligocene.

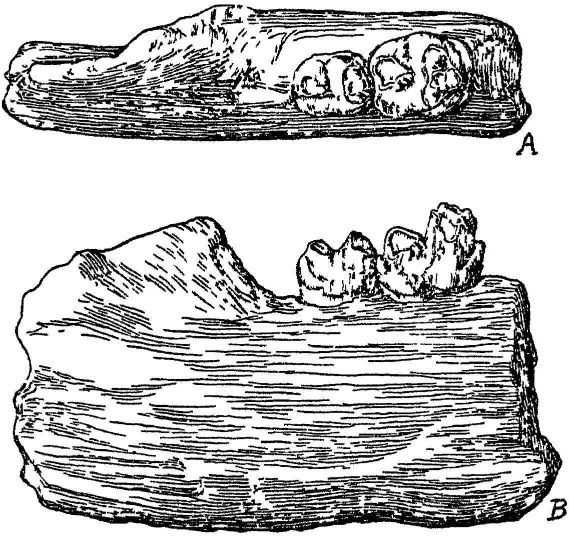
Locality.—Yarmouth, Isle of Wight.

Dimensions.

	mm.
Length of M_2+M_3	12
Length of M_2	6·4
Breadth of M_2	5·1
ngth of M_3	5·4
of M_3	4·3

Description.—The teeth are peculiar. It is proposed to describe the second molar first and then to point out the differences seen in the third molar.

In the trigonid of the second molar the protoconid is larger than the metaconid, which, in its turn, is larger than the paraconid. The two former are compressed from behind forwards—a condition which, taken together with the reduction of the paraconid, has the effect of compressing the entire trigonid in the same sense. There was a vertical posterior ridge, or buttress, on the hinder surface of the metaconid towards the middle line of the tooth. This is now worn off and its position marked by a scar.



Dyspterna woodi, gen. et sp. n.

A, holotype seen in crown view; B, the same seen from the lingual surface. Both figures twice natural size. Regd. No. M 13125, B.M. (Geol. Dept.).

The hypoconid is very stout. It has two sharp ridges, one in the centre of the anterior surface and one postero-internally.

Adjoining the hypoconid, in the position of the entoconid, is a shelf which slopes slightly inwards. It is smooth except for three small pustules at the base of the hypoconid.

Around its edge is a strongly-marked ridge, which probably represents the margin of a vanishing basin and has the appearance of having been beaded, though, owing to subsequent damage, this is not at all clear. As it approaches the hypoconid, the ridge becomes higher and ends posteriorly in a minute cusp which may be regarded as the hypoconulid.

The anterior cingulum is strong and well marked. It starts fairly high up on the antero-internal surface of the paraconid. From this point it drops away rapidly on the lingual side, to end just in front of the base of the metaconid. On the buccal side it does not slope so steeply, and, as it proceeds downward, it becomes more pronounced and shelf-like, though never to such an extent as to make a definite shelf. The buccal termination is at the base of the anterior face of the protoconid and slightly in advance of the lingual termination.

The third molar is built like the second, but is a little smaller. The paraconid is smaller in proportion, and the trigonid is not so compressed. The posterior ridge of the metaconid runs downwards and outwards to meet the anterior ridge of the hypoconid, while in the second molar these ridges are practically parallel. There is only one ridge on the hypoconid, the posterior ridge being absent.

In front only the antero-external cingulum is present. The internal half is not developed.

The postero-internal shelf and ridge are as in the second molar, but there are no pustules at the base of the hypoconid.

Discussion.—The peculiarity about these teeth is the entire absence of the entoconid. If either of the two main cusps which compose the talonid is suppressed, it is invariably the hypoconid which goes. In this case it is the other way round. The entoconid has been lost, whereas the hypoconid is unusually large and stout. This is a feature which does not appear to have been observed in any teeth hitherto described.

No genus so far as known approaches *Dyspterna* at all closely. Its systematic position is a matter of some doubt; but, for the present, it may be placed among the Creodonta, and possibly included in the family Oxyclænidæ.

The generic name is derived from δυς- and *πτέρνα*, the heel. The trivial name is given after the discoverer, Mr. S. L. Wood.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[NINTH SERIES.]

No. 116. AUGUST 1927.

XXII.—*A new Species of* Capitosaurus *from the Trias of the Black Forest.* By W. E. SWINTON, B.Sc., F.G.S.

(Published by permission of the Trustees of the British Museum.)

[Plate IV.]

AMONG the recent acquisitions of the Geological Department of the British Museum there is a block of liver-coloured micaceous sandstone bearing a fine impression of the upper surface of the skull of a Stegocephalian. The sandstone infilling is preserved in the form of a block, which, fitting into the mould of the upper surface, retains the impression of the visceral surface of the dermal skull-roof. This block is broken posteriorly so as to display the quadrate ramus of the pterygoid, and has been so developed as to expose the hinder parts of the parasphenoid and pterygoid. The bones are reduced in thickness and are now represented by little but the impressions of the dorsal surface, to which a white film of bone adheres. The specimens were obtained from the Lower Triassic (Buntersandstein) rocks of Villingen, in the Black Forest of Southern Baden, a locality noted for its Stegocephalian remains (see Wepfer, 1923).

The skull appears to have suffered no damage from crushing during burial or fossilisation, and Mr. F. O. Barlow, Preparator in this Department, has made from the impression an excellent plaster-cast which shows most of the skull perfectly with all the bones in the natural position. From the cast and the palatal bones exposed as already explained, it is possible to describe the specimen with a considerable degree of completeness.

A brief examination of the several features preserved is sufficient to show that the specimen differs in many respects from any of the species of *Capitosaurus* so far established, and I therefore propose to describe it as a new species.

Genus CAPITOSAURUS, Münster.

Capitosaurus semiclausus, sp. n.*

Diagnosis.—Squamosal and tabular approaching posteriorly, so that the posterior part of the otic notch is half closed. Sculpture very coarse. Parietal foramen circular. Orbits comparatively large, ovate, and with their axes approximately parallel to the lateral borders of the skull. Postfrontals semicircular. Jugals excluded from the orbital margins. Prefrontals wedge-shaped, broad posteriorly and narrowing anteriorly, articulating for a short distance with the postorbitals on the external border of the orbit. Nasals longer and narrower than in *C. nasutus*. Rostrum narrower and blunter than in that species.

Holotype.—External mould of the skull in sandstone and slab of sandstone with portions of the palatal bones of the same individual. Registered Brit. Mus. Geol. Dept. R. 5276. The plaster-cast of the cranium is registered R. 5277.

Horizon and Locality.—Lower Trias (Buntersandstein), Villingen, Black Forest of Southern Baden, Germany.

Dimensions.—The following dimensions were taken from the plaster-cast and actual bones, and are compared with the measurements given by Schroeder (1912) for the Halle specimen of *C. nasutus.* Dimensions marked with an asterisk are to be taken as approximate, since the posterior border of the left side of the skull to be described is not complete; the right dermo-supraoccipital is very nearly, if not quite, entire :—

---

* Latin, "semi"=half, "clausus"=closed. Referring to the half-closed otic notch.

Upper surface of skull.

	C. semiclausus. mm.	*C. nasutus.* mm.
Length of the skull along the middle line (*a*)	267	280
Length along the rostrum to the point where the line joining the centres of the orbits cuts the middle line	197	205
Length from the back of the skull to the same point (*c*)	71	77
Length along the middle line from the snout to the centre of the foramen parietale	222	234
Length from the back of the skull to the same point (*d*)..................	45	47
Distance of the otic notch from the centre of the orbit	58	73
*Greatest breadth of the skull (*b*)	220	223
*Distance of inner angles of the otic notches from one another	96	115
Breadth of the skull in the region of the centres of the orbits	165	182
Breadth of the skull in the region of the centres of the nares	62	88
Distance (least) of the orbital margins from one another	39	50
Greatest length of the orbit	30	35
Greatest breadth of the orbit	27	27
Breadth of the foramen parietale........	8	10
Length of the nares	19	26

Palatal surface of the skull.

	C. semiclausus.	*C. nasutus.*
Smallest breadth of the pterygoids between the palatal and temporal vacuities ..	21	27
Breadth of the parasphenoid in line with the posterior ends of the palatal vacuities	30	46

Hinder surface of the skull.

	C. semiclausus.	*C. nasutus.*
Height of the skull from the parasphenoid plate to the hinder border of the foramen parietale	30	—

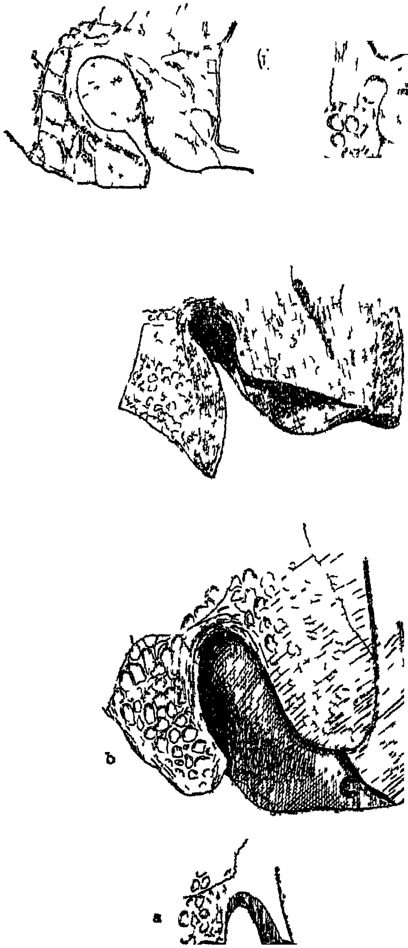
These measurements give the following ratios for the two skulls :—

	C. semiclausus.	*C. nasutus.*
1. *a* : *b*........	1·213	1·255
2. *a* : *c*........	3·760	3·635
3. *a* : *d*........	5·933	5·957

It will be seen that in the general proportions of the skull the new species is quite close to *C. nasutus*.

Description.—The upper surface of the skull, though incomplete on the posterior border of the left side, shows at

Fig. 1.



The otic notch in Capitosauridæ.

a. *Capitosaurus fronto* (after von Meyer); b. *Capitosaurus nasutus* (after Schroeder); c. *Capitosaurus helgolandiæ* (after Schroeder); d. *Capitosaurus semiclausus*, sp. n.; e. *Cyclotosaurus stantonensis*.

All figures except *C. helgolandiæ* half-size—that species one-quarter natural size.

once several features of great interest (Pl. IV.). The ornament, which appears to be coarser than in any other species of the genus, and the unique condition of the otic notch are particularly striking. The notch is somewhat similar to that of *Cyclotosaurus*, but here a narrow channel 18 mm. long and 3 mm. wide at its narrowest part communicates with the exterior. The well-marked sutures show up the triangular shape of the parietal, which is more triangular than that shown in the somewhat composite figure of *C. nasutus* given by Schroeder (1912), but rather like that figured by Roepke (1923) for the same species. A feature of great interest is that the jugal takes no part in the formation of the orbital border. The postorbital-jugal and the jugal-prefrontal sutures approach and meet about 3 mm. from the antero-external border of the orbit, with the result that over that short space the postorbital articulates with the prefrontal. The prefrontal, as a consequence, is also somewhat different in shape from that of *C. nasutus*, and has its orbital breadth almost equal to its maximum breadth. Further, the postorbital is wing-shaped. The postfrontal, as has been stated, is semicircular. The frontals are shorter and broader than in *C. nasutus*. The lachrymal (postnasale of Schroeder; adlacrymale of Roepke) is a short and narrow bone only half the length of the nasal; it does not reach the posterior border of the narial opening, and in this respect is unlike that of *C. nasutus*, but very similar to that of *Kestrosaurus* (Haughton, 1925). The nasals are 108 mm. long and 28 mm. broad, as compared with 100 mm. and 32 mm. in the specimen of *C. nasutus* figured by Schroeder.

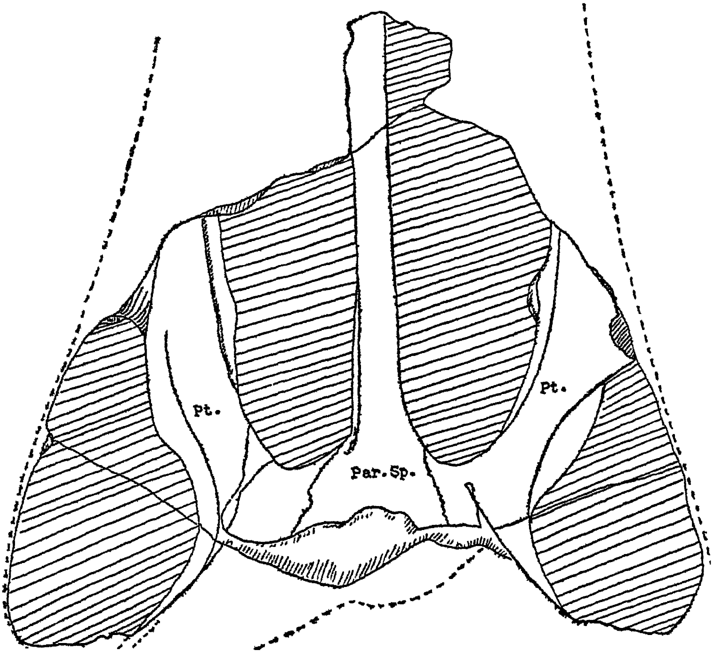
The remaining bones of the dorsal surface show no features worthy of remark.

The orbits are somewhat ovate, the long axes being approximately parallel to the lateral borders of the skull. They are surrounded by a sharply-defined ridge which stands 8 mm. above the surface of the adjacent frontals. From the antero-medial border of the orbits prominent ridges run on the skull-surface to the narial apertures, being continued on the medial side of these openings almost to the tip of the snout. The nares are shorter and narrower than in *C. nasutus*.

A few teeth on the premaxilla and maxilla are reproduced on the cast. The premaxillary teeth appear rather widely and irregularly spaced, though this is no doubt due to displacement or loss of some of the intervening ones. They are about 5 mm. long, narrowly conical, and compressed antero-posteriorly. The maxillary teeth are small and regularly arranged structures, similar in character to those of the premaxillary but with a length of 3 to 4 mm.

The under surface of the skull with the posterior parts of the pterygoids and parasphenoid has been made out from the fragment and is shown in fig. 2. It will be seen that the parasphenoid is incomplete posteriorly and, as preserved, is comparatively small both in length and breadth. It also appears asymmetrical, the left parasphenoid-pterygoid suture, as far as can be made out, being more medianly placed than the right. The right suture, however, is seen on the actual surface of the bone, while the left is only traceable on the underlying matrix, so that the asymmetry

Fig. 2.



The palatal aspect of *C. semiclausus*. One-half natural size.

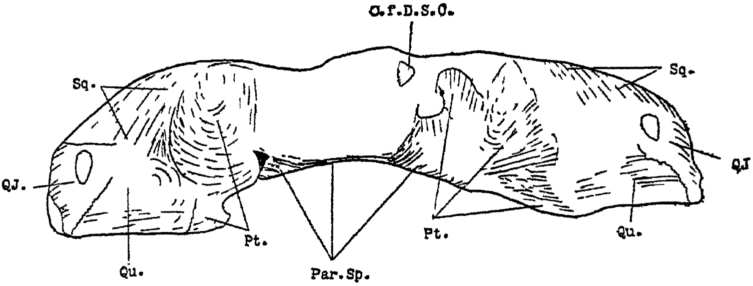
Par.Sp.=parasphenoid; *Pt.*=pterygoid. The dotted line shows the position of the impression of the upper surface of the skull when the palatal fragment is fitted into the mould.

is probably only apparent. The width of the parasphenoid at the posterior end of the fragment is 41 mm. The anterior part of the bone is long and slender as compared with the broad and well-developed palatal branches of the pterygoids. The latter, as might be expected from the state of preservation, show no trace of the well-marked sculpture seen in *C. helgolandiæ*. The posterior part of the parasphenoid is concave as in *C. africanus*, but the anterior part is convex (palate-wards) and not flat as in that species.

In the occipital region the condyles and their supporting bones are entirely missing, and, indeed, only slight traces of bone, or the coloration or smoothness of the matrix where bone has been, give any clue to this part of the skull.

Examination under a binocular reveals that the quadrate ramus of the pterygoid was closely similar to that of the *Capitosaurus* sp. so fully described by Watson (1919). It appears to have been a thin plate rising nearly vertically and having a long and close connection with both the supratemporal and the squamosal. Nearer to the middle line than this are traces of the parasphenoid and what appears to be the pro-otic with a notch for the passage of the vena capitis lateralis and the seventh nerve. Close to the middle line (see fig. 3) there is a definite trace of the occipital flange of the dermo-supraoccipital. This is important, as it makes it possible to reconstruct the position of the condyles with certainty. Traces of the quadrato-jugal and the quadrate—which can be seen passing under the quadrato-jugal and the pterygoid—are observable, as are the foramina quadrata situated in the quadrato-jugals. The region, imperfect as it is, much more similar to Watson's *Capito-*

Fig. 3.

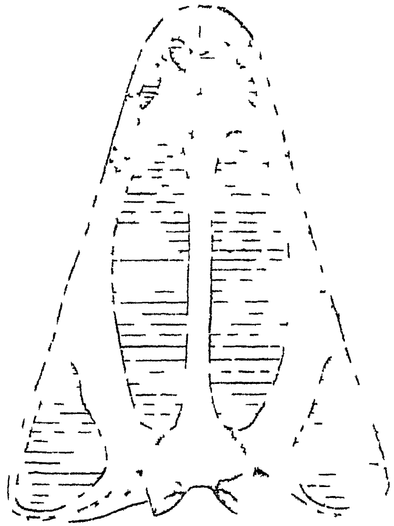


The occipital region of *C. semiclausus*. One-half natural size.

O.f.D.S.O.=occipital flange of the dermo-supraoccipital; *Sq.*=squamosal; *QJ.*=quadrato-jugal; *Qu.*=quadrate.

saurus sp. than to any of the others so far figured. One striking feature of this part, and one which differs markedly from Watson's specimen, is its shallowness. The height measured from the centre of the parasphenoidal plate to the surface of the parietal just posterior to the parietal foramen, and allowing for the thickness of the missing bone, is only 30 mm. This is much less than in Watson's specimen, where the height must be about twice this amount. The whole region as seen in fig. 3 is strikingly broad and shallow. From the evidence afforded by the palatal and basi-cranial portions of the skull it is possible with a considerable degree of certainty to reconstruct the general outline of the cranium in palatal view. Such a reconstruction is given in fig. 4, where it will be noticed that the line joining the posterior limits of the occipital condyles is coincident with the line joining the hinder borders of the skull. This condition is exactly halfway between that of *Capitosaurus* and *Cyclotosaurus* (see Watson, *loc. cit.* p. 53).

Fig. 4.



C. semiclausus. Palate. About one-quarter natural size. Stippled areas are restored.

Comparison and Conclusion.

Watson, in his valuable memoir on the structure of the Amphibia (1919), points out that of the remains referred to this genus only *C. nasutus*, von Meyer (1858), *C. fronto.*

von Meyer (1858, *l. c.*), *C. africanus*, Broom (1909, and Haughton, 1925), *C. helgolandiæ*, Schroeder (1912), and *Capitosaurus* species of Watson (1919, *l. c.*) can be regarded as definitely determinable. *C. arenaceus*, Münster (1836), and *C. polaris*, Wiman (1915), are obviously indeterminable, while *C. stantonensis*, Smith Woodward (1904), as several authors have already pointed out, belongs to the genus *Cyclotosaurus*.

The present form is readily distinguishable from any of the hitherto established species by the form of the otic notch, the very coarse ornament, and the character of the orbital margin.

From *C. nasutus*, the best-known and most frequently figured member of the group, it differs in many additional particulars, most of which have been referred to. They may be enumerated as the characters of the frontals, nasals, lachrymals, and the quadrate branches of the pterygoids, the direction of the pterygoid-parasphenoid sutures, and the general proportions of the skull.

C. fronto, which is not so completely known, is distinguishable only by the general characters of size, the otic notch, and sculpture.

C. helgolandiæ is distinct by reason of its much larger size and the different proportions of the orbit, as well as the characters already referred to.

C. africanus, as described by Broom and redescribed by Haughton, is best distinguished by the characters of the palatal region. The parasphenoid bone here is flat compared with the definitely convex bone of *C. semiclausus*. The two skulls are alike in having the distance from the posterior border of the dermo-supraoccipital (post-parietal) in the middle line to the posterior border of the parietal greater than the distance from the posterior border of the parietal to the parietal foramen. In this character both species differ from *C. nasutus*. The skull of *Capitosaurus* described by Watson, and so like the new species in the basi-cranial region, is much narrower and higher and thereby quite distinct.

It will be clearly seen, therefore, that the specimen described above is not only quite new but is also a very interesting member of the family Capitosauridæ. In the character of its otic notch and in the position of the occipital condyles it stands halfway between the genera *Capitosaurus* and *Cyclotosaurus*, and in the characters of some of the facial bones is halfway between *Capitosaurus* and *Kestrosaurus*. *Capitosaurus* and *Cyclotosaurus* are two distinct genera, though intermediate between the two in certain characters, must be placed in the genus *Capitosaurus*. Since Watson's review of the Capitosauridæ several new species have been added and some new facts brought to light. In any consequent reconsideration the new form described above must play an important part.

LITERATURE LIST.

BROILI, F. 1915. "Ueber *Capitosaurus arenaceus*, Münster," Zbl. Min. Geol. Paläont. 1915, p. 569.

BROOM, R. 1909. Ann. S. Afr. Mus. vii. 3, p. 271 (*Capitosaurus africanus*).

HAUGHTON, S. H. 1925. Ann. S. Afr. Mus. xxii. 3, p. 239 (*Capitosaurus africanus*), p. 242 (*Kestrosaurus*).

KUNISCH, S. H. 1890. Z. deuts. geol. Ges. xlii. 3, p. 377 (*Capitosaurus silesiacus*).

VON MEYER, H. 1858. 'Palæontographica,' vi. Lief. vi. (*Capitosaurus nasutus* and *C. fronto*).

ROEPKE, W. 1923. "Der Schädelbau von *Capitosaurus nasutus*," Geol. Archiv. i. 2, p. 65.

SCHROEDER, H. 1912. "Ein Stegocephalen-Schädel von Helgoland," Jahrb. preuss. geol. LdAnst. xxxiii. Teil ii. Heft 2, p. 232.

WATSON, D. M. S. 1919. "The Structure, Evolution, and Origin of the Amphibia," Philos. Trans. ser. B, ccix. pp. 1–73.

WEPFER, E. 1923. "Der Buntsandstein des badischen Schwarzwalds und seine Labyrinthodonten," Monog. z. Geol. u. Paläont., Serie 2, Heft 1.

——. 1923. "*Cyclotosaurus papilio*, sp. n.—ein Beitrag z. Kenntnis des Stegocephalen-Hinterhauptes," Mitt. bad. geol. LdAnst. ix. p. 369.

WIMAN, C. 1913. "Ueber das Hinterhaupt der Labyrinthodonten," Bull. Geol. Inst. Univ. Upsala, xii. p. 1.

——. 1915. Bull. Geol. Inst. Univ. Upsala, xiii. p. 1 (*Capitosaurus polaris*).

WOODWARD, A. S. 1904. Proc. Zool. Soc. Lond. 1904, ii. p. 170 (*Capitosaurus stantonensis*).

EXPLANATION OF PLATE IV.

Capitosaurus semiclausus, sp. n.

The upper surface of the skull. B.M. (Geol. Dept.), R. 5277. Approximately one-half natural size. (Photo. H. G. Herring.)

XXIII.—*Two new Species and a new Genus of Cretaceous Pycnodonts from the South of England.* By ERROL IVOR WHITE, of the British Museum (Nat. Hist.).

(Published by permission of the Trustees of the British Museum.)

THE two Pycnodont vomers described below are in a state of preservation unusually good for specimens from English Cretaceous rocks, which, with the exception of the Wealden strata, rarely yield other than unsatisfactory fragments, and these but seldom. The first species is of two-fold interest: it is apparently the first Pycnodont to be described from Aptian rocks, and it has the premaxillary teeth of one side attached to the vomer. The second specimen comes from the Chalk, and, like most of the other English examples from the same formation, it is of doubtful genus. Both specimens are preserved in the Geological Department of the British Museum.

Gyrodus atherfieldensis, sp. n. (Fig. 1, *a*, *b*, & *c*.)

Specific Characters.—A species of *Gyrodus* known only by the vomerine and premaxillary dentition. Teeth of vomer perfectly smooth, in five regular rows closely adpressed. Median teeth once and a third to once and a half as broad as long; teeth of inner paired row nearly circular, one-half as broad as median teeth and of the same length as outer paired teeth, which are elliptical in shape and obliquely placed. Premaxillary teeth broad and claw-like.

Material.—The unique holotype, a nearly complete vomerine and right premaxillary dentition (Brit. Mus. no. P.13295).

Formation. — Aptian (Lower Greensand, 'Crackers' horizon).

Locality.—Atherfield, I. of Wight.

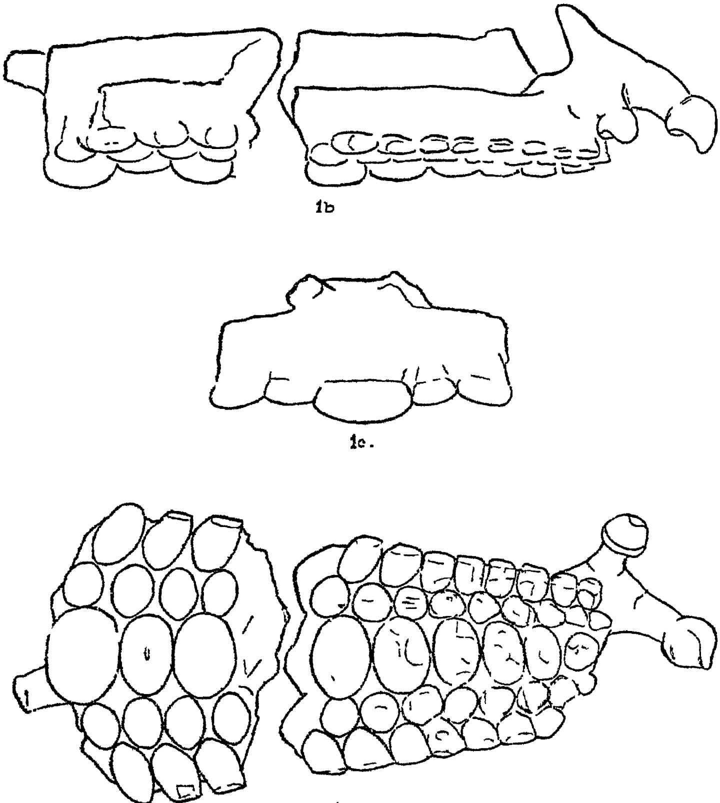
Description.—The specimen is complete, except for the loss of one transverse row of vomerine teeth, which had been pyritized and subsequently decayed.

The vomerine dentition is 7·5 cm. long and has a maximum breadth of 3·75 cm. In front it is uneven, as there are more teeth preserved on the right side than on the left, most likely owing to the unequal falling away of the older teeth as the larger teeth came into use.

The five rows are very regular, and the teeth increase evenly in size towards the rear, with the exception of the last median tooth but one, which is abnormally small. All the teeth are without ornament, and those that are unfacetted by wear are bean-like in their convexity.

Nine of the elliptical median teeth are preserved, and of them the hindmost tooth measures 0·95 cm. in length and 1·25 cm. in breadth. Of the teeth of the inner paired rows 12 are present on the left side and 13 on the right. Although generally circular in shape they vary somewhat and are rather broader than long in the hinder portion of the dentition, the dimensions of the most posterior being 0·6 × 0·7 cm. These teeth are in close contact with the median teeth and with those of the outer paired series with which they alternate. The oblique outer teeth are nearly once and a half as broad as long when unworn, and the largest measures 0·80 × 0·55 cm.

Wear has only affected the first five median teeth and the inner paired teeth to the same level, but all of the flanking series, except the last pair, are facetted on the outer side. The fourth tooth of the left row has an irregular indentation in the crown and lies below the general level of the dentition.



Gyrodus atherfieldensis, sp. n.

Vomerine and right premaxillary dentition. 1 *a*, oral view; 1 *b*, right lateral view; 1 *c*, posterior view. (P. 13295—× 1.)

The premaxilla is greatly reduced in comparison with that of *Mesturus* (A. S. Woodward, 1896, p. 7), and the outer lateral margin is much excavated behind, leaving a pointed process dorsally. The bone is above the level of the vomer, and, although the teeth are borne on long pedicles, they do not reach the plane of the grinding dentition. The prehensile teeth, of which the inner is much the larger, are of the usual broad claw-shape and have a strong basal cingulum.

Remarks.—Except for odd fragments and isolated teeth, this appears to be the first species described from Aptian beds. It is distinguished at once from most species of the genus by the smoothness of the teeth; in this character it most nearly approaches *G. cotteaui* (Sauvage, 1879, p. 36), from which it otherwise differs in the shape and close arrangement of the teeth.

This specimen was collected by the late Mr. Reginald W. Hooley, who obtained many magnificent fossils from the Lower Cretaceous rocks of the Isle of Wight.

"*Gyrodus*" *bennetti*, sp. n. (Fig. 2, *a* & *b*.)

Specific Characters.—A series of Pycnodont conveniently referred to *Gyrodus*, and known only by the vomerine dentition. Teeth sub-mammiform with prominent cingulum faintly crenulated, in three principal rows, with two rows of small teeth intercalated in the posterior half of dentition. Principal teeth (in front of jaw irregular in size and shape) increasing evenly in size towards rear, those of median row becoming wider than long and somewhat heart-shaped (lateral principal teeth probably similar when unworn); intercalated teeth longer than wide and irregularly shaped.

Material.—The unique holotype, a small imperfect vomerine dentition (Brit. Mus. no. P. 12938).

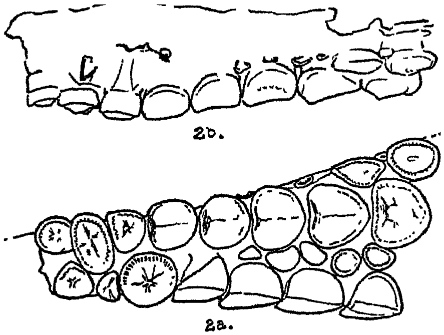
Formation.—Chalk (probably *Terebratulina* zone).

Locality.—Pit at Southeram, near Lewes, Sussex.

Description.—The specimen is only 2·5 cm. long. The left lateral row of teeth is missing except for a fragment of a root in front, and of the intercalated series on the same side only the two most posterior teeth and four roots remain. The rest of the dentition is, however, very well preserved. There are eight teeth in the median row, seven in the lateral principal row, and five of the intercalated series. The specimen is so broken that the very short pedicles of the teeth and a section of the adherent bone are clearly displayed.

The front part of the dentition is irregular. The foremost median tooth is presumably normal, being roughly circular in outline and of the proper size, but the second tooth is twice as wide as long, and so encroaches on the right lateral row of which the corresponding tooth is in consequence small. Both the third median tooth and the first lateral are irregularly triangular in shape, and the former is also smaller than it should be; the third lateral is, on the other hand, of full size and rounded. The triangular form of the fourth tooth in this row is due to a fracture received during life. The other principal teeth are normal.

The small intercalated teeth vary much in shape, and serve to fill in the spaces between the principal rows. Those on the right side of the specimen commence in the interval between the fifth and sixth median teeth and increase gradually in size towards the rear: all these are of small size. But while the four broken sockets of the left row indicate teeth of similar proportions, the two hindmost members, which are intact, are very much larger, and between them is a minute, but complete, tooth that does not, however, reach the level of the remainder.



" *Gyrodus* " *bennetti*, sp. n.

Imperfect vomerine dentition. 2 *a*, oral view; 2 *b*, left lateral view. (P. 12938—×2.)

The wear of the teeth is instructive, for it shows clearly that the dentition was malformed. The irregular front teeth, being the oldest, would, in a normal dentition, be the most worn; but in this case they are absolutely fresh, and as seen in side-view they are below the general trituration level and, therefore, never came into use. This is almost certainly due to a juvenile injury, which hampered the full development of these teeth, and the irregularity in their shape must also be due to the same cause.

The other teeth are in the usual stages of wear. The median teeth, from the fourth to the seventh, are evenly worn on either side, but less and less as the posterior end of the vomer is approached, so that the seventh tooth shows very slight signs of abrasion and the eighth none at all. Similarly, the three most anterior of the interstitial teeth are worn smooth, while the more posterior are untouched. The teeth of the lateral principal row, like those of the median row, each bear two trituration facets, but in this case they are unevenly developed, for the wear on the outer side has greatly exceeded that on the inner, and nearly half each tooth has been worn away in all but the hindmost member of the series, which is naturally affected to a much less degree.

Remarks.—This species is named in honour of the collector, Mr. W. H. Bennett, A.R.S.M., F.G.S. It is referred to *Gyrodus* for convenience, although the irregularity of the intercalated rows is certainly not typical of the genus ; indeed, in this feature, both it and the other Upper Cretaceous species, *G. cretaceus*, Agassiz, seem to resemble rather more *Mesturus*, which has "three principal series, with a varying number of irregular, small, intercalated series" (Woodward, 1895, p. 218).

It is almost certain that these two species do not belong to any described genus, and the differences in the crowns of the teeth point to their belonging to two different genera: that of *G. bennetti* is not yet definable, but so much is known of the dentition of *G. cretaceus* (Woodward, 1902–12, pp. 167 & 251) that the erection of a new genus for its reception seems necessary. For this I propose the name

POLYGYRODUS, gen. nov.

Diagnosis.—Teeth very high, mammiform, usually longer than wide ; arranged on the vomer in three principal rows with a variable number of small irregular teeth intercalated between ; and on the splenial in one, more or less regular, principal row flanked by irregular series of numerous small teeth covering the whole bone.

Genotype. — The only known species, *P. cretaceus* (Agassiz).

LITERATURE.

SAUVAGE, E. 1879. Bull. Soc. Sci. Yonne, vol. xxxiii.
WOODWARD, A. S. 1895. Catal. Foss. Fishes B.M. vol. iii.
—— 1896. Ann. & Mag. Nat. Hist. (6) vol. xvii.
—— 1902–12. 'Fossil Fishes English Chalk' (Mem. Pal. Soc.).

XXIV.—*Some new Caucasian Orthoptera.*
By B. P. Uvarov.

Acrididæ.

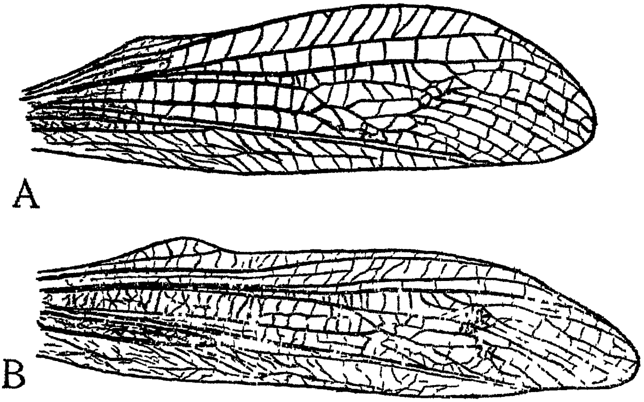
Chorthippus (Stauroderus) hirtus, sp. n.

Small, but rather robustly built, allied to *St. daimei*, Azam, from the Alps.

♂ (type). *Antennæ* nearly twice as long as head and pronotum together, thick, slightly flattened.

Head distinctly thicker than pronotum. Face moderately oblique. Frontal ridge throughout with a deep sulcus, becoming shallow near the fastigium and the clypeus; margins distinctly raised throughout, subparallel, feebly divergent downwards. Fastigium of vertex distinctly sloping; its angle acute, not rounded at the apex, with the sides distinctly concave; surface practically flat, margins scarcely raised, but sharp. Temporal foveolæ more than twice as long as broad, distinctly curved, not strongly impressed, but sharply marginated, slightly narrowed in front, and very narrowly separated from each other at the fastigium.

Fig. 1.



Chorthippus (Stauroderus) hirtus, sp. n.
Elytra of the male (A) and of the female (B).

Pronotum feebly constricted. Disc rounded-tectiform, front margin rounded, hind margin rounded-obtusangulate. Median keel low, linear. The typical sulcus distinctly behind the middle. Lateral keels feebly developed, slightly convergent between the front margin and the first sulcus, considerably rounded-inflexed, but scarcely perceptible between the sulci, in the metazona feebly divergent. Lateral lôbes somewhat higher than long.

Elytra not quite reaching the apex of the hind knees, relatively very broad; their maximum width distinctly behind their middle and subequal to $\frac{1}{3}$ of their length, anterior margin in the apical half strongly rounded, the apical half broadly oval. Mediastinal field not reaching the middle of the front margin, distinctly dilated beyond its middle, with the false vein well developed; mediastinal vein sinuate. Scapular field strongly dilated, with regular, moderately oblique, parallel veinlets. Interradial field distinctly dilated, regularly reticulate, the cells being subquadrate; first radial vein straight; second radial slightly sinuate, distinctly incrassate, attenuate both basally and apically. Discoidal field parallel-sided, fairly regularly reticulated, somewhat broader than the interulnar field, which is also regularly reticulated. Anal field broad. Hind margin of elytra straight.

Wings a little shorter than elytra, broadly rounded behind.

Hind femora relatively short and thick; the upper carina of the externo-median area practically straight.

Abdomen thick, cylindrical, somewhat recurved apically. Subgenital plate very short and obtuse. Cerci very short, broad, triangular.

Coloration pale brownish grey, inclined to ochraceous in parts. Antennæ dark brown. Pronotum without any markings. Elytra with the veins and veinlets greyish and pale ochraceous; a group of veinlets in the apical fourth whitish, forming an indefinite spot. Anal area with a row of fairly large, but faint, greyish spots. Wings slightly infumate apically. Hind femora on the outside dirty stramineous, with blackish dots along the keels; upperside with two large blackish fasciæ extended on to the inside and for a very short distance on to the outer side; knees with blackish semilunar spots on the sides; lower surface slightly reddish. Hind tibiæ coral-red, the apex beneath brown; spines entirely black. Abdomen yellow; tergites of the basal half with broad black rings; more than the apical third orange-red.

Whole body and legs, especially underside, in dense long hairs.

♀ (paratype). Not large, but quite robust. Antennæ scarcely longer than head and pronotum. Frontal ridge sulcate from the base of antennæ downwards, with thick raised margins. Elytra reaching the penultimate tergite and the base of the hind knees; their apex somewhat attenuate, obliquely parabolic; mediastinal field extending almost to the apex of the scapular field, which is somewhat expanded, irregularly reticulate and provided with a false vein; discoidal and interulnar fields irregularly reticulated. Valvæ of the ovipositor very short and stout, without teeth. Coloration more uniformly brownish ochraceous than in male; the pale pre-apical spot on the elytra scarcely distinct; dark fasciæ of the hind femora subobsolete; hind tibiæ reddish grey, blackened apically beneath.

Daghestan: Rutul, 30. viii. 1924, 3 ♂ ♂ (including the type), 2 ♀ ♀; Achty, 1 ♀ (*M. Riabov*).

Subsp. *debilis*, nov.

Distinctly smaller than the typical form; elytra narrower; mediastinal field without a false vein; interradial field of male with the cells elongate; apex of elytra somewhat attenuate in both sexes.

Daghestan: Bazar-Duzi, 25. viii. 1924, 4 ♂ ♂ (including the type), 3 ♀ ♀; Shalbuz-Dagh, 23. viii. 1924, 2 ♂ ♂, 2 ♀ ♀ (*M. Riabov*).

	Typical form.		Subsp. *debilis*.	
	♂.	♀.	♂.	♀.
	mm.	mm.	mm.	mm.
Total length	18·5	22·5	13·5	17·5
Length of elytra	12·5	13	9·5	12
Maximum width of elytra	4	3·5	3	3
Length of hind femora	10	11·5	7	9·5

Types in the Zoological Museum, Petrograd; paratypes in the British Museum.

This new species is very close to *daimei*, Azam (*St. saulcyi*, Kr., var. *daimei*, Az., Ann. Soc. Ent. France, lxii. 1893, p. 184; I consider it a good species), and represents, perhaps, only its subspecies. Its typical form differs from *daimei* (when compared with specimens from Col d'Allos named by Azam himself) by distinctly larger size; larger and thicker head, less oblique face, frontal ridge not constricted at the ocellum; fastigium more sloping, its apical angle more acute with the margins not straight, but concave. Temporal foveolæ in *daimei* are straight, more broadly separated, not narrowed anteriorly. Elytra in *daimei* are only ¼ as broad as long and their apex is attenuate, parabolic; cells of interradial area elongate. Hind knees in *daimei* are blackened in both sexes, which is not the case in both races of *hirtus*.

The smaller race *debilis* is still closer to *daimei* than the typical race, but differs from *daimei* in the shape of temporal foveolæ, not constricted frontal ridge, slightly broader and less attenuate apical elytra, and not blackened hind knees. The two races of *hirtus* differ from each other only in relative characters, but the differences are quite sufficient for separating them. It seems that *debilis* is a subspecies inhabiting higher altitudes than the typical *hirtus*.

CAUCASIPPUS, gen. nov.

♀. Similar in the general habitus to *Podisma* (or to *Conophyma*), but belonging to Acridinæ and representing, probably, a highly aberrant member of the *Arcyptera*-group.

Antennæ ordinary, short.

Face distinctly oblique. Frontal ridge thick, flat, gradually widened downwards. Fastigium of vertex convex, sloping and forming a widely-rounded angle with the frontal ridge; margins almost obsolete, very faintly perceptible; lateral areas (corresponding to the foveolæ of vertex) broad, flat, perfectly visible from above. Occiput convex. Eyes relatively small, very broadly parabolic, with the anterior margin straight; their vertical diameter only a little longer than the horizontal one, and considerably shorter than the subocular distance.

Pronotum short, conical, with the disc convex. Median keel very low, linear; lateral keels slightly indicated in front of the first sulcus and in metazona, cut by all sulci. Metazona much shorter than prozona; hind margin obtusely excised. Lateral lobes with the lower margin slightly sinuate.

Prosternum convex (broadly inflated), but without any tubercle. Mesosternal lobes very short, strongly transverse, separated by an interspace which is considerably broader than one of the lobes. Metasternal lobes separated by a broad transverse interspace.

Elytra rudimentary, lateral. Tympanal organ semilunar, only partially open.

Ovipositor stout; lower valvæ unarmed.

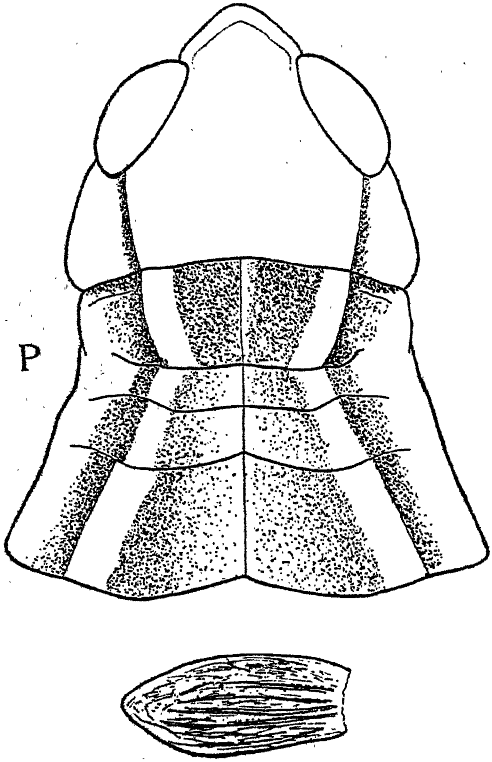
Hind femora rather narrow, gradually narrowed towards the knee. Hind tibiæ without an outer apical spine, with ten spines on each side. Tarsal pulvilli well developed.

Caucasippus pedestris, sp. n.

♀. *Antennæ* rather thick, compressed, reaching only to about the middle of pronotum; joints quadrate, or nearly so.

Frontal ridge with distinct, though not dense, punctures, round the ocellum smooth; margins gradually divergent downwards, obtuse throughout and practically obsolescent near clypeus. Lateral facial keels feeble, slightly S-shaped curved. Distance between the eyes almost twice as broad as frontal ridge between antennæ.

Fig. 2.



Caucasippus pedestris, gen. et sp. n.
P, head and pronotum; E, right elytron.

Pronotum somewhat rugulose. Transverse sulci first and third better developed than the second; sections of the disc separated by the sulci (as measured along the median keel) may be represented by the proportion 4 : 1·5 : 1·5 : 5. Lateral keels very slightly raised in front of the first sulcus, towards which they are feebly convergent, and behind the last sulcus where they diverge very strongly; the keels are, however, very irregular and noticeable mainly because of the accompanying pattern. Hind margin with a very obtuse excision, the margins of which are somewhat convex. Lateral lobes in metazona punctured-rugulose; their hind lower angle practically right, rounded; hind margin almost vertical.

Mesonotum partially uncovered by the pronotum, its visible portion somewhat longer than one of the two middle sections of pronotum (in the above proportion the length of mesonotum would be represented by 2). Metanotum equal in length to metazona of pronotum. Abdominal tergites, as well as mesonotum and metanotum, smooth, with a very low and obtuse median carinula.

Elytra lateral, reaching to the middle of the first tergite, lancet-shaped, with almost obsolete straight veins.

Coloration pale dirty brown with blackish dots and markings. Upperside of the head paler than its sides and separated from them by castaneous postocular fasciæ. Pronotum with a pale X-shaped pattern on the lateral keels; its lateral lobes with blackish and brown dots, especially in metazona just below the pale pattern. Metanotum and abdomen, the latter especially on the sides, with blackish longitudinal lines and streaks; there is a faint suggestion of two pale fasciæ, forming a prolongation of the pronotal pattern. Hind femora on the outer face with two indefinite blackish oblique fasciæ and some blackish dots along the upper edge; their inner face, as well as the underside, pale dirty olivaceous, with broad, but irregular and interrupted, blackish fasciæ; knees brownish. Hind tibiæ dirty olivaceous, turning slightly reddish on the upperside, while the underside is somewhat blackened towards the apex; their spines with blackish tips.

Length of body 23; pronotum 4; elytra 3; hind femora 10·5 mm.

Described from a single female taken by Mr. D. A. Tarnogradsky in the alpine zone of the Central North Caucasus, between Kazbek and Naltchik. The type in the Muséum d'Histoire Naturelle, Paris (Collection Lucien Chopard).

This remarkable little grasshopper would be placed without hesitation into the genus *Podisma* by anyone familiar with Palæarctic Orthoptera, but an examination of its prosternum reveals at once that it has nothing to do with the whole subfamily Catantopinæ, and must be included into Acridinæ (Truxalinæ). Its position within the latter cannot be exactly defined, while only the female sex is known. The structure of pronotum, with its sulci cutting lateral keels, suggests some relationship with *Arcyptera*, and the broad "foveolæ" of vertex, which are so flat as not to deserve the name, are also of the type observed in the latter genus.

Thalpomena ledereri obscura, subsp. n.

Differs from representatives of this species from Central Transcaucasia (Tiflis) by uniformly slate-black colour, without spots on the elytra; face, sides of the head, and hind femora ashy-grey; hind tibiæ bluish grey (or bluish black); hind wings of a more dull red colour, their fascia very broad and dark, and the whole apical part of the wing infumate, more so at the apex itself.

Length of body, ♂ (type) 19, ♀ 25; pronotum, ♂ 4, ♀ 5·5; elytra, ♂ 18, ♀ 23; hind femur, ♂ 10·5, ♀ 13 mm.

The male type and two female paratypes taken between Chodo-Kolo and Gidatl, 20 vii. 1924; two female paratypes from Rutul, 30. viii. 1924 (*M. A. Riabov*). Those localities are all in the mountains of Daghestan.

The type is in the Zoological Museum, Petrograd; one of the paratypes in the British Museum.

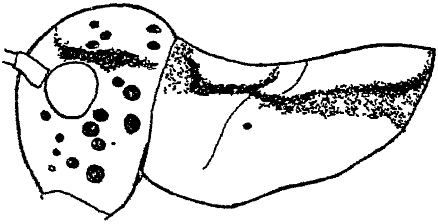
Tettigoniidæ.

Pœcilimon riabovi, sp. n.

♂. Of medium size for the genus, relatively slender.

Head globular, with the occiput strongly convex. Frontal fastigium in the shape of a small low tubercle. Fastigium of vertex narrower than the second antennal joint, with a scarcely perceptible furrow apically.

Fig. 3.



Pœcilimon riabovi, sp. n., ♂.

Pronotum long, very strongly selliform, scarcely at all widened behind. Hind margin rounded-truncate. Hind margin of the lateral lobes distinctly sinuate.

Elytra covered by the pronotum beyond their middle, strongly coriaceous, broadly rounded, moderately inflated.

Abdomen elongate. Supra-anal plate transverse, rounded. Cerci as long as subgenital plate, round, gradually and feebly curved in more than their basal half, more strongly incurved in the apical third; apex with a short point. Subgenital plate large, convex in transverse direction, almost carinate along the middle (this may be due to drying); apex fairly broad, with an obtusangular emargination.

Legs moderately long. Hind femora with 11–12 spinules on each side below.

Coloration dirty pale olive-green. Antennæ blackish, with widely distant narrow pale rings. Face, cheeks, and occiput with irregularly distributed, fairly large, round, blackish spots. Supraocular fasciæ black, not regularly defined. Pronotum with irregular black lateral fasciæ turning reddish castaneous in parts; this latter colour spreads along the anterior and the posterior end of prozona, leaving in the middle of prozona an irregularly quadrangular pale spot; in metazona the lateral fasciæ are strongly dilated, mainly castaneous-red. Elytra very pale brownish, with broad black lateral fasciæ. Abdomen brownish basally, pale dirty olivaceous in the rest, with small scattered round dark spots, and with a large transverse brownish-black lateral spot on each segment basally, the spots forming an interrupted lateral fascia. Cerci dark castaneous basally, black in the rest. Front femora with a blackish stripe above, and the two lower carinæ narrowly black; front tibiæ with a blackish line along the upperside. Middle femora with the lower inner carina black; middle tibiæ blackish along the upperside. Hind femora with small round dark spots in the lower part of the outer face; two lower carinæ black; hind tibiæ blackened apically.

Total length 22 mm.; pronotum 6; visible portion of elytra 2; front femora 8; hind femora 8.

Daghestan: Bilidzhi, 19. viii. 1924, 2 ♂ ♂ (*M. Riabov*).

Type in the Zoological Museum, Petrograd; paratype in the British Museum.

The globular head and relatively very long, strongly selliform, not widened behind pronotum make this species easily recognisable.

XXV.—*On further Patagonian Mammals from Neuquen and the Rio Colorado collected by Señor E. Budin.* By OLDFIELD THOMAS.

BY the help contributed by friends, principally by the Misses Godman, Sr. Budin has been enabled to continue his work in Neuquen, at Collon Curá and Quilquihué, and he afterwards journeyed to Pichi Mahuida, a place on the Rio Colorado halfway towards the east coast, where he obtained a further set, including several interesting forms. Among these there is a special race of the small Mendoza skunk *Conepatus proteus*, whose known range is thus very considerably extended.

The two districts worked being some distance apart, I think it better, for the sake of geographical clearness, to make separate lists of the mammals obtained at each.

A.—NEUQUEN.

The localities worked are two—Collon Curá, at about 800 m., in Southern Neuquen, on the Upper Limay, about 100 km. to the east of San Martin de los Andes; and Quilquihué, also 800 m., in the same region.

1. *Conepatus suffocans enuchus*, Thos.

♀. 2778. Collon Curá.

This specimen, in the prominence of the white bands and their extension down on to the sides of the base of the tail, shows a resemblance to the *C. s. gibsoni* of Eastern Buenos Ayres, but in the softness of the fur it agrees with *C. s. enuchus*, to which it should no doubt be referred. Indeed, one of the original specimens of *enuchus* has something of the same extension, although not so strongly marked.

The following are the skull-measurements of an adult male from the original locality, those of a female only having been previously available:—

Greatest length 65 mm.; condylo-basal length 64; zygomatic breadth 45; interorbital breadth 21·4; mastoid breadth 36·8; maxillary tooth-row 20; inner antero-posterior diameter of m^1 7·1.

2. *Rattus norvegicus*, Erxl.

2, Collon Curá; 1, Quilquihué.

Living quite wild.

3. *Oryzomys longicaudatus*, Benn.

18, Collon Curá; 4, Quilquihué.

These specimens average larger than those from the Eastern Argentine, and old specimens tend to have their fur more or less intermingled with flattened semi-spinous hairs.

4. *Phyllotis xanthopygus*, Waterh.

4, Collon Curá; 10, Quilquihué.

5. *Reithrodon cuniculoides*, Waterh.

♂. 2698, 2706, 2716, 2717. Quilquihué.

Quite like the ordinary dark *Reithrodon*, with strong buffy belly—not resembling the pale form from Zapala which I named *R. c. evæ* in the previous paper.

6. *Euneomys micropus alsus*, Thos.

♂. 2710; ♀. 2715. Quilquihué.

7. *Akodon nucus*, Thos.

9, Collon Curá.

8. *Akodon canescens*, Waterh.

♀. 2792. Collon Curá, 800 m.

9. *Abrothrix hirtus*, Thos.

4, Collon Cura; 3, Quilquihué.

These agree closely in colour with the type from San Rafael, while a little paler and greyer than "*A. suffusus mœrens*" of San Martin. *A. hirtus* and *A. suffusus* thus evidently pass into each other, and should be united specifically under the former name.

10. *Ctenomys mendocinus haigi*, Thos.

12, Collon Curá.

On laying out Sr. Budin's fine series of tuco-tucos of the *C. mendocinus* group, comprising sets of from eight to a dozen examples from Tupungato (Mendoza), Chos Malal, Las Lajas, Zapala, Collon Curá, and Pilcañeu, all in a north and south line on the eastern slope of the Andes, we are able to see something of their mutual relationships. To the north we have from Mendoza, San Rafael, and Tupungato the true *mendocinus*, the series certified by containing what I believe to be an original Philippi specimen. This animal is a comparatively warm brown. Then follows, from Chos Malal, a form to which, on the ground of locality, we may assign the name *maulinus* of Philippi, smoky grey instead of brown, without any trace of darker muzzle or dorsal markings. Next, from Las Lajas and Collon Curá comes a very similar animal, but distinguished by an increasing tendency to a marked blackening of the muzzle and a dark wash of blackish down the centre of the back, never sharply defined, and sometimes scarcely perceptible. This would seem to be indistinguishable from the animal I named *C. haigi lentulus* from Pilcañeu, near Nahuel Huapi, but which, owing to the extent to which increased series has shown certain of the colour-characters to vary, I should now unite with *haigi* of Maiten, calling everything from Las Lajas to Maiten *C. mendocinus haigi*. Indeed, in the development of yellowish flanks the Las Lajas tucos are quite as strongly marked as those from Maiten.

But to the east of Chos Malal, at Zapala, halfway down the general series, there occurs a more open country form, without darker markings, and perhaps a little paler, but not really distinguishable from true *mendocinus*, which appears to range over the whole median pampas area, where it intergrades with *azaræ*. The latter's type-locality is on the open plains at 37° 45′ S., 65° W. (not as originally published). The tucos from Pichi Mahuida are clearly of this same form, and, in spite of the distance between the two places, are remarkably like those of Zapala. Sr. Budin thought them to be different, but I quite fail to distinguish them.

11. *Galea negrensis*, Thos.

2, Collon Curá; 10, Quilquihué.

12. *Caviella australis nigriana*, Thos.

♀. 2750. Collon Curá.
"Among the dunes."—*E. B.*

13. *Marmosa elegans pallidior*, Thos.

♀. 2744, 2753, 2762, 2763. Collon Curá.

B.—PICHI MAHUIDA.

This place is on the Rio Colorado about 65° W., 650 m. altitude, some 500 km. east of the places previously referred to, and is in a region where a collection is of particular value, as showing what animals occur in the centre of the great pampas. Hitherto practically nothing has been obtained from that area, and we have been completely ignorant as to how far the eastern species extend towards the Andes, and, conversely, how far east the Andean forms occur. Although the collection is but a small one, it is on this account of much interest, and we may hope, will be supplemented later.

As above indicated, it contains a series of a new skunk, allied to the small *Conepatus proteus* of Cordova.

The following are the species obtained:—

1. *Conepatus proteus gaucho*, subsp. n.

♂. 2834, 2844, 2845, 2846, 2853, 2855; ♀. 2840, 2847, 2354.

Essential characters of small size and mixed black and white tail as in the typical *C. proteus* of Cordova and San Juan, but the amount of white is on the average further reduced and the hairs of the tail are differently coloured, more as in *C. suffocans*. In both *proteus* and *gaucho* the extreme terminal hairs, forming the white tuft, are wholly white to their bases, but, putting these aside, the other hairs are in *proteus* wholly black in nearly all cases, but in *gaucho* they are black only for their terminal third, the basal two-thirds being white. It is only at the base of the tail that the hairs are black to their roots, as in *proteus* they are for two-thirds or more of the tail. There is therefore a conspicuous difference between the two forms if the hairs of the tail are spread out and viewed as a whole—in *proteus* black for the basal half of the tail, then equally mixed black and white; in *gaucho* black only for the absolute base, then broadly white in the middle area and broadly black outside it, the terminal fringe being white in both.

As in *C. proteus*, the general colour of the animal is a brownish black, with an absolutely black head. The stripes, on the average, are inclined to be reduced even more than in the typical form, consisting in some cases of a mere white tick on each side of the crown, while in one skin not even these are present. On the other hand, in some specimens a narrow white line runs nearly to the tail.

Dimensions of the type:—

Head and body 236 mm.; tail 166; hind foot 44; ear 19.

Skull: greatest length 60; condylo-basal length 57·2; zygomatic breadth 36; interorbital breadth 19; mastoid breadth 33; maxillary tooth-row 19·1; m^1, greatest diameter 8·1, inner antero-posterior diameter 6·2.

Hab. as above.

Type. Young adult male. B.M. no. 27. 6. 21. 3. Original number 2845. Collected 9th April, 1927.

Alternatively this skunk might be considered as a small form of *C. suffocans*, whose tail-coloration it imitates, but I prefer to consider its identity in size with *C. proteus* as its primary specific character. Whether its range joins that of the latter must await further exploration.

Sr. Budin was extremely interested in the capture of this "zorrinito," whose difference from the larger *C. suffocans* he quickly recognized, and the fine series he took pains to prepare has enabled me to make very satisfactory comparisons of it with its allies.

It is of interest to note that that splendid collector Mr. Bridges obtained what appears to be one of these animals in 1845, but, as with so many of his specimens, it was registered as from "Chili," and we have no knowledge as to its true locality. If *gaucho* occurs at San Rafael he no doubt got it there, but in that case the range of the subspecies is more extensive than we have as yet any real reason to assert.

2. *Graomys medius*, Thos.

14 ♂, 5 ♀.

As usual in this difficult group, the specimens differ widely among themselves in the extent to which the belly-hairs are wholly white or are broadly slaty at base, every condition being present.

G. medius seems to be smaller than *G. griseoflavus*, discovered by Darwin at the mouth of the Rio Negro. Like *Hesperomys murillus*, it appears to range over a large area of the inland pampas, but the differences between the various races of the group are somewhat intangible, and I am by no means sure what is the name that should properly be applied to the present form.

3. *Hesperomys murillus cordovensis*, Thos.

♂. 2828; ♀. 2812.

A considerable extension of the known range of this pale form of the La Plata laucha, and it evidently occurs over a very large area of the inland pampas.

At Bonifacio, S.W. Buenos Ayres, however, not very far off, the more saturate form *H. m. murillus* occurs, coloured absolutely as in examples from La Plata.

4. *Eligmodontia typus*, F. Cuv.

♂. 2817, 2827, 2850, 2856, 2858.

5. *Akodon neocenus*, Thos.

♂. 2803, 2806, 2809, 2842; ♀. 2813, 2824, 2825, 2833.

A most acceptable series, as this species was hitherto only known from the original set, which consisted of two specimens preserved in spirit and a very imperfect skin. The present set are rather browner, a little less grey, than the paratype skin, but the difference may be due to the imperfection of the latter, and there can be no question as to their specific identity. The nearest ally would seem to be *A. dolores*, of Cordova, which is of a darker and browner colour, without the slight olivaceous suffusion present in *neocenus*.

Compared with *A. nucus*, *A. neocenus* is larger, longer-haired, and the bicolor character of the tail is less strongly marked. The skull is larger, with a broader interorbital region, and the teeth are more hypsodont. Groove on front face of m^1 present, but hardly so deep as in *nucus*.

One skull, that of a very old specimen, is no less than 30·5 mm. in length.

6. *Ctenomys mendocinus*, Phil.

2 ♂, 8 ♀.

♂. 2830, 2843; ♀. 2800, 2801, 2802, 2811, 2814, 2831, 2841, 2849.

As already noted, the Pichi Mahuida tuco-tucos are referable to *C. mendocinus*, of which *C. azaræ* would appear to be a synonym. The neighbouring *C. porteousi* is larger, with larger bullæ, and is darker in colour.

One specimen is piebald—partially albino.

7. *Galea negrensis*, Thos.

2 ♂, 3 ♀.

8. *Caviella australis nigriana*, Thos.

1 ♀.

XXVI.—*Notes on the Two Genera* Nusa *and* Pogonosoma (Laphrinæ). By GERTRUDE RICARDO.

Asilidæ.

LAPHRINÆ.

NUSA, Walker.

Dipt. Saund. pt. ii. p. 105 (1851).
[*Dasythrix*, Loew, Progr. Realeschule Meseritz, p. 21 (1851); id. Dipt. Süd-Afrik. i. p. 126 (1860).]

Priority must be given to Walker's name, as, with the kind help of Major Austen, I discovered the publication of

Loew's paper did not take place till Sept. 27th, 1851, whereas Walker's paper was published on June 3rd, 1851. This latter author gives a very short diagnosis of the genus, and does not mention the characteristic venation of the wing —viz., the absence of the ambient vein of wing posteriorly, and the failure of the veins to reach the hind border, or, if they do so, they become very fine. Loew gives an ample description of the genus in his Dipt. Süd-Afrik.

Walker established the genus for two species from East India, and, as far as I am aware, he does not mention it again except in the Dipt. Brit. Mus., Suppl. 3—a mere repetition. On examining these two species, I find they belong to the genus *Dasythrix*, Loew (which, as stated above, must give priority to Walker's genus), and have nothing to do with the genus *Andrenosoma*, Rondani. The genus *Nusa*, Walker, must be no longer confused with *Andrenosoma*, to which it bears no kind of resemblance.

The confusion seems to have originated with Williston, who, in Trans. Amer. Ent. Soc. Philad. xviii. p. 80 (1891), sinks *Nusa* under *Andrenosoma*, Rondani. V. d. Wulp, in his Cat. Dipt. S. Asia (1896), places the two species of *Nusa* under Rondani's genus, which was founded in 1856, and after 1896 Aldrich and other American authors give *Nusa* priority, while the late Professor Hermann, in his Beiträge Kennt. südamerik., Dipt. Fauna, p. 239 (1912), does the same, making *Nusa æqualis* the type of the genus, and alluding with approval to the figure of it in Ins. Saundersiana. His long notes on this genus under the name of *Nusa* will now apply to *Andrenosoma*, which must take the place of *Nusa* in Kertesz's Cat., and my species *Nusa africana*, and *queenslandi* and *tectamus*, Walker, will be respectively *Andrenosoma* species.

The genus *Andrenosoma*, Rondani, is richest in species in the Neotropical and Palæarctic Regions ; only one species is mentioned from the Oriental Region, viz., *crassipes*, Fabr., from Sumatra.

The genus *Dasythrix*, now *Nusa*, was forme [illegible] species from S. Africa ; a few species are also recorde [illegible] Arabia and S. America, one from S. Europe, and one [illegible] eria.

[illegible] *in the Oriental Reg* [illegible]

1. Third [illegible] ted . . . . . 2.
Third j [illegible] . . . . . 3.
2. Legs e [illegible] omen
black, [illegible] at
sides . [illegible] . . . . *æqualis*, [illegible]

	Legs blackish, tibiæ and tarsi dull reddish brown. Scutellum and black abdomen with pale pubescence	*elva*, ♂, Wlk.
	Legs with distinctly yellow knees. Abdomen brownish, with lighter tomentose segmentations	*formio*, ♂ ♀, Wlk.
3.	Tibiæ extensively yellowish at base. Abdomen blackish, with pale segmentations. Moustache pale	*grisea*, ♂ ♀, Hermann.
	Black species. Legs and moustache black. Abdomen with four pale side-spots	*yerburyi*, ♂ ♀, sp. n.
	Legs black. Moustache pale. Abdomen ashy white on the basal half	*albibasis*, ♂, sp. n.

Nusa æqualis, ♀, Walker.

Ins. Saund., Dipt. part ii. p. 105, pl. iv. fig. 4 (1851); List Dipt. Brit. Mus. vii., Suppl. 3, p. 564 (1855).

Type (female in poor preservation) from East India. Type of the genus.

It may be distinguished from *Nusa formio*, Wlk., by the absence of any reddish-yellow or honey-yellow colour on the *legs*. The third joint of the *antennæ* is somewhat longer, the moustache pale yellow. *Abdomen* black, with white tomentose spots at sides, not covered apparently with tawny pubescence and tomentum as in the above-mentioned species. In both these species the third joint of the antennæ is chiefly reddish or tawny.

Nusa elva, Walker.

List Dipt. Brit. Mus. ii. p. 445 [*Asilus*] (1849); id. vii., Suppl. 3, p. 553 (1855).

Type (male) from North Bengal (Miss Campbell's Coll.).

This small species was described under *Asilus* by Walker, who apparently overlooked the peculiar venation and other particulars; neither does he mention the sex. This species has a general resemblance to some of the African species, and has, like them, the short third joint of antennæ.

A black species, with distinct ashy-grey segmentations on the abdomen, and the scutellum is covered with the same coloured tomentum.

Length 15 mm.

Male.—*Face* covered with ashy-grey tomentum. *Moustache* composed of numerous strong black bristles and a few short white hairs at sides. *Antennæ* with the two first joints largely tawny and with black bristles; these latter are very strong on the back of the head. *Thorax* blackish, with grey tomentum at sides and on shoulders, the pubescence black, with stout black bristles at sides. *Scutellum* bordered with a thick row of black bristles and a few black hairs intermixed.

Abdomen black; the pale tomentose segmentations become wider at the sides, pubescence and the bristles at sides black. *Genitalia* rather large, the upper pincers partly tawny, pubescence black. *Legs* blackish, the tibiæ and tarsi reddish brown, pubescence black, long soft hairs on undersides of femora and tibiæ, the tips sometimes inclining to tawny colour, bristles black and numerous. *Wings* clear, veins reddish brown.

Walker, when he created the genus *Nusa* in 1851, evidently overlooked the fact that his species here mentioned would belong to it.

Nusa formio, ♀ ♂, Walker.

Ins. Saund. Dipt. part ii. p. 106 (1851); id. List Dipt. Brit. Mus. vii., Suppl. 3, p. 564 (1855).

Type (female) from East India.

Three females and four males from Trincomalee, Ceylon (*Yerbury*).

This species is distinguished from *Nusa grisea*, Hermann, from Formosa, by the shorter rounder shape of the third joint of antennæ; in *N. grisea* this joint is distinctly elongated and longer than the first joint, whereas in this species it is not so long. The honey-yellow colour of the legs in the Formosan species is here confined to the knees, otherwise it generally resembles *N. grisea*. The *ovipositor* is small, armed with stout black bristles; the *genitalia* of the males is also rather small, with long narrow upper pincers, the lower pair shorter. Thoracic and scutellar bristles very stout, the shorter stout ones on the legs yellowish or whitish. *Moustache* composed of yellowish-white bristles, with black bristles on the lower part of the face. In the type and one or two of the other specimens two or more stray black bristles appear in the middle of the moustache.

There are several specimens in the Brit. Mus. Coll. allied to these three species, but different, not in sufficiently good preservation and chiefly isolated specimens, so that it is not advisable to describe them.

Nusa yerburyi, ♂ ♀, sp. n.

Type (male) from Hiniduma, Ceylon, 28. iv. 92 (*Yerbury*).

Type (female) from Kottawa, Ceylon, 19. iv. 92 (*Yerbury*).

A robust, medium-sized, blackish species with wholly black legs and black moustache. Third joint of antennæ elongated, reddish at apex.

Length, ♂ 21, ♀ 22 mm.

Male.—*Face* covered with ashy-grey tomentum. *Moustache* composed of black bristles and hairs; a few short white hairs above and two longer yellow ones. Palpi and proboscis with black hairs. *Antennæ* black, the first two joints with many black bristly hairs, the third joint longer than the first, the basal narrow part black, the apical broadened part black at the base only. Ocelligerous tubercle with two very stout black bristles. Hind part of head with two very stout ones and smaller ones on each side. Collar black, covered with yellowish-brown tomentum and with black bristles and hairs. *Thorax* black, with two well-marked, triangular, yellowish-brown, tomentose spots on the shoulders, which are bordered below with a lighter grey tomentose band, extending along the sides of thorax; a very narrow stripe the same colour as the shoulders is visible at the suture proceeding from the sides, distinct in the female, probably denuded in the male. Dorsum of thorax with fine black hairs, longer anteriorly and posteriorly, armed at sides with the usual very stout black bristles. *Scutellum* the same colour as thorax, with yellow-brown tomentum, and armed on posterior border with a row of very stout black bristles. *Abdomen* brownish black, with very narrow lighter segmentations and black pubescence, bristles at sides yellow with pale hairs. *Ovipositor* black, shining, short, but swollen with black pubescence. *Legs* with black pubescence, which is long and soft on the tibiæ, the femora with fine pale hairs, white and thick on the anterior pair, all bristles black. Underside of the fore and posterior tibiæ with a thick short brush of golden-yellow hairs. *Wings* dusky, the first and fourth cell closed as usual, the veins not so attenuated as in some species; the veinlet from the dorsal cell is so, and does not reach the border; some pale streaks are visible on the basal part of wings.

Female identical, but hairs below proboscis white, soft, and long. Palpi with white pubescence. Third joint of *antennæ* duskier. *Legs* more heavily armed with bristles, especially the anterior tibiæ and tarsi. *Abdomen* stouter. *Ovipositor* very short.

Nusa albibasis, ♂, sp. n.

Type (male) from Kaleewa, Chindwin, Upper Burma, May 1893 (*Lt.-Col. E. Y. Watson*).

Another male from Yoonzalein Valley, Burma, April 1891 (*Col. Bingham*).

A species at once distinguished by the pale ashy-white tomentum on the first three segments of the black abdomen. Moustache pale yellow. Legs black.

Length, type 22, second male 18 mm.

Face protuberant as in all the species here mentioned, covered with ashy-grey tomentum. *Moustache* composed of yellowish-white long soft hairs. *Antennæ* with reddish bristly hairs on the lower sides of the first two joints, the third joint elongated, nearly as long as the first two together. Bristles on ocelligerous tubercle and posterior part of head stout, black. Collar brownish black, with black bristles in the centre and white hairs at sides. *Thorax* brownish black, with some grey tomentum; two dark median stripes are visible; pubescence on dorsum thick, black, short, but longer posteriorly, the ashy-grey tomentose shoulders with short black hairs; the stout black bristles at sides and posteriorly are numerous. *Scutellum* the same colour as the thorax, but the pale ashy-white colour of abdomen is visible on the anterior half of scutellum. *Abdomen* blackish, the pale segments with white pubescence; this pale colour is continued on the sides of the segments, reaching in a narrow line to the centre of the fourth segment; pubescence on the dark parts black, white at the sides of abdomen. *Genitalia* rather large, black and shining, with black pubescence. *Legs* black, with white pubescence and yellow bristles. *Wings* clear, veins not strikingly attenuated.

ANDRENOSOMA, Rondani.

Subgenus POGONOSOMA, Rondani.

Founded by Rondani in 1856 for species with three submarginal cells; but, as v. d. Wulp and Hermann point out, this is hardly a good enough character to divide it from *Andrenosoma*, Rondani, some specimens having been found with the dividing vein which separates the first submarginal cell into two absent in one wing and present in the other. Hermann states if it is retained it should be looked upon as a subgenus of *Andrenosoma* (*Nusa*).

The subgenus seems widely distributed in the Oriental Region (where there are eight species), the Palæarctic and Nearctic Regions (both represented by four species each).

Rondani made *Laphria maroccanum*, Fabr., the type of the genus.

Pogonosoma fusifera, ♀, Walker.

Proc. Linn Soc. Lond. i. p. 12 (1856) (*Laphria*); v. d. Wulp, Col. Dipt. S. Asia, p. 89 (1896) (*Andrenosoma*).
[*Pogonosoma analis*, de Meijere, Tijd. Ent., Suppl. lvi. p. 53 (1913).]

This species (a female from Singapore) was correctly placed in *Andrenosoma*, but, having the three submarginal cells, it falls into this subgenus.

De Meijere's species (a male from Java and a female from Sumatra) is evidently identical with it, from the description. In Walker's type, measuring about 15 mm., the first posterior cell is almost closed on one wing and narrowly open on the other, as in de Meijere's types, which measure 18 mm.

There is a much damaged specimen measuring 25 mm. from Siam (presented by H.R.H. Prince of Champon) in the Brit. Mus. Coll., probably a male, having the last segments of the abdomen foxy red, with the same coloured pubescence as described by de Meijere.

The female has these last segments blackish, but covered with the foxy-red pubescence. Prof. de Meijere considers *Pogonosoma beccarii*, Rondani, from Borneo, also with a red apex to abdomen, as distinct from his species.

Pogonosoma cedrusa, ♀, sp. n.

This specimen was sent me for identification in January 1924 by Dr. C. F. C. Beeson at Dehra Dun, stating that it had been bred from wood. He kindly gave me permission to keep it for the National Collection. No species of this subgenus has as yet been described from India, though *Pogonosoma fusifera*, Walk., is from Singapore, and *Pogonosoma funebris*, Hermann, is from Formosa (a co-type of this species is in the Brit. Mus. Coll.), and is distinguished from this Indian species by the dull black colouring of abdomen, the incrassate femora, and the darker wings.

Pogonosoma semifusca, v. d. Wulp, must be nearly allied to this new species, which is distinguished from it by the brighter blue metallic colouring of the abdomen, the simple hind femora, the shorter ovipositor, and the less well-defined colouring of the wings.

Type (female) from Fagu, 8000 ft., Simla Hills, 8. iv. 1922 (*C. F. C. Beeson*). Bred from *Cedrus deodara*.

A medium-sized species, with purple bluish shining metallic abdomen. Face with black bristles and white hairs. Legs nearly the same colour as the abdomen, with white pubescence. Wings tinged brown.

Length 19 mm.

Face blackish brown, the tubercle large, covered with stout black bristles, forming the moustache, a few fine white hairs intermixed. Cheeks with long fine white hairs, a few shorter black ones on each side below the antennæ. Palpi with black hairs. Beard white. Hind part of head with bristly black hairs, becoming weaker and reaching round to the proboscis. On the ocelligerous tubercle two weak black bristles. *Antennæ* with the first two joints blackish brown and with stout black bristles (third broken off). *Thorax* dull blue, with brighter metallic glittering patches on the sides, devoid of the brownish-yellow tomentum on dorsum, which is nearly bare of pubescence anteriorly, but the sides have long soft black hairs disposed in groups; prealar bristles stout, three in number, postalar two in number. Posterior part of dorsum with rather numerous weak black hairs, and the tomentum here is whitish. *Scutellum* dark blue, somewhat shining, with no bristles (denuded); on the specimen from Khasi Hills there are two weak black ones. *Abdomen* almost devoid of pubescence, sides of anterior segments with long white hairs; on the posterior segments shorter black hairs predominate; on each segment one or more stout black bristles are present on the sides, and the second, third, and fourth have small triangular white tomentose spots. *Ovipositor* short, no longer than the last segment. *Legs* dull bluish, but the anterior pair are more brownish than blue, and the same is the case with the middle pair; pubescence long, white, thickest on the tibiæ; on the femora it is black above and intermixed with white hairs below; the tarsi with black hairs and bristles; there are numerous long black bristles on the tibiæ and one or more stout ones on the hind femora towards the apices; the underside of tibiæ with thick brush-like foxy-red hairs. *Wings* tinged brown, paler at the extreme base, with clear white spots in all the cells on the posterior border except the apical one, and including the fourth posterior cell; the first posterior cell is widely open, the brown colouring is more intense on the anterior border in the centre. Halteres pale.

A very much damaged specimen from Khasi Hills, India (*F. W. L. Sladen*), seems identical with the type; it is also a female. A female from Trincomalee, Ceylon, is very nearly allied to these, but appears somewhat different.

XXVII.—*Description of Two Subspecies of Leopards.*

By R. I. Pocock, F.R.S.

The Persian Leopard.

The stone-grey leopard of Persia, Seistan, and Baluchistan has always been assigned to the form named *tulliana* by Valenciennes. The typical example of *tulliana* came from Ninfe or Ninfi, a small village 40 kilometres east of Smyrna, where it was procured by Tchihatcheff. The British Museum possesses a flat skin of an adult leopard, presented by Mr. W. Forbes, who got it at Aidin in the Pachalie District of Anatolia less than fifty miles from Ninfe. To all intents and purposes, therefore, this skin is a topotype of *tulliana*. It is not grey and ounce-like in colour, but, although paler than typical Indian or East African leopards, is still decidedly tawny or buff on the dorsal area and is much more richly tinted and shorter-coated than the Persian form. Since the latter, therefore, appears to be without a name, I propose to call it *Panthera pardus saxicolor*.

Panthera pardus saxicolor, subsp. n.

Coat thicker and more woolly in texture than in typical leopards, with the ground-colour much paler, being whitish grey, faintly tinged with yellowish-buff and lacking the rich yellowish or reddish tawny hue characteristic of most races of leopards. The spots are variable in size and distinctness, and their centres are at most only slightly darker than the ground-colour.

Distribution. Persia, Seistan, and Baluchistan.

Type. A mounted specimen from Astrabad, North Persia, shot by Lt.-Col. Beresford Lovett (B.M. no. 82.11.3.4).

In addition to the type, the British Museum possesses a skin from Seistan, presented by Col. R. L. Kennion, and one from the Perso-Baluchi border, shot by Capt. J. E. B. Hotson. I have also seen an alleged Persian specimen purchased from Hagenbeck and exhibited in the Zoological Gardens, and I am indebted to Mr. Poland for the loan of of a skin traded out of Persia.

The Abyssinian Leopard.

Colonel H. G. C. Swayne long ago drew attention to the existence in the highlands of Abyssinia of a very handsome dark leopard, which from its size he called a panther, the skins of which "are used in thousands by the Abyssinian soldiers as cloaks." He referred also to the blackness of the dorsal area of their skins, due to the size and close planting of the spots. Presumably it was this leopard that Mr. Lydekker wrote of as the large Abyssinian leopard, under the name *Felis pardus nimr*, Ehrenberg. The leopard so-named by Ehrenberg was, however, a small pale leopard, easily distinguishable from the dark panther mentioned by Col. Swayne.

I am indebted to Mr. Poland for the loan of six skins of of this leopard, which were traded out of Abyssinia, and, since this leopard appears to be unnamed, I propose to describe it as *Panthera pardus adusta.*

Panthera pardus adusta, subsp. n.

Coat short, close, and smooth. General colour decidedly dusky buffish grey, with scarcely a trace of the bright tawny yellow tint seen in most races of leopards. The darkness of hue is further enhanced by the pigmentation of the central area of the rosettes, which is sometimes quite small, sometimes altogether obliterated, so that a larger percentage than usual of the spots are actually solid, or appear at a distance to be solid. The dorsal area is darker than the flanks, its pigmentation frequently being so deep as to constitute a broad band extending from the head to the root of the tail.

Distribution. The highlands of Abyssinia.

The exact locality of the type-specimen presented by Mr. Poland to the British Museum is unknown.

Of the six skins examined, three are normally coloured and three are melanistic varieties. The latter, however, are not nearly so black as typical black leopards from Further India and Java; the black spots, except on the middle line of the back, standing boldly out on the brown ground-colour.

The skins, native prepared and stretched apparently only to a negligible extent, range in size from about 6 ft. 6 in. to 8 ft. 2 in.

XXVIII.—*Some new Parasitic Nematodes from Australia.*

By H. A. Baylis, M.A., D.Sc.

(Published by permission of the Trustees of the British Museum.)

The five species to be described in this paper formed part of a collection of Nematodes made by Dr. G. M. Heydon, of the Australian Institute of Tropical Medicine, and kindly forwarded by him to the British Museum (Natural History). Co-type specimens will be deposited in both institutions

Fam. Strongylidæ.

Subfam. TRICHONEMINÆ.

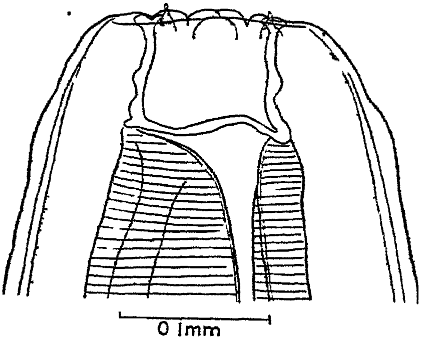
Macropostrongylus yorkei, sp. n. (Figs. 1–3.)

Host: Wallaby (*Macropus* sp.).

Locality. Townsville, North Queensland.

The genus *Macropostrongylus* was erected by Yorke and Maplestone (1926) for two species found in a wallaby in Queensland. The present collection contains—in addition to two females of *M. macropostrongylus*, one of *M. australis*, and a large number of specimens of *Labiostrongylus labiostrongylus*, Yorke and Maplestone—five males and a number of females of a new species of *Macropostrongylus*. All these were taken from the same wallaby. The writer is greatly indebted to Professor Warrington Yorke for kindly placing at his disposal and presenting to the British Museum (Natural History) co-type specimens of the two species of the genus already described, as well as other forms described by Yorke and Maplestone from the wallaby. These have been of the greatest assistance in the study and determination of the present material.

Fig. 1.



Macropostrongylus yorkei. Anterior end of female; lateral view.

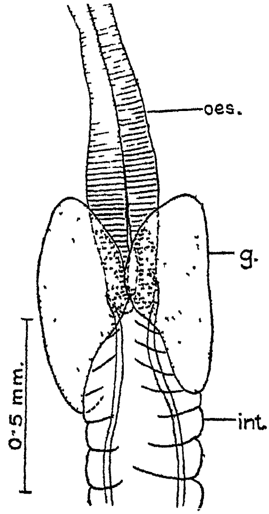
The dimensions of the male and female of the new species are very dissimilar, and it will be best to describe the sexes for the most part separately.

Male.—Length 9–11 mm. Maximum thickness 0·43–0·47 mm. Cuticular striations about 3·8 μ apart. Distance from anterior extremity to the posterior end of the œsophagus

2–2·2 mm. From the same point to the cervical papillæ 0·35–0·38 mm.; to the nerve-ring 0·6 mm. The excretory pore is situated in the neighbourhood of the posterior end of the œsophagus, and may be either in front of or behind this level. The length of the buccal capsule is about 0·075 mm. The œsophagus decreases in diameter in its middle region to about 0·1–0·13 mm., increasing again near its posterior end, where it forms a slight spindle-shaped swelling, to 0·17–0·19 mm.

The bursa is of the same form as in the two species described by Yorke and Maplestone, having a distinct ventral lobe. Each of the two main branches of the dorsal ray (fig. 3) gives off a lateral branch at about the middle of its length, and the whole dorsal ray presents quite a different appearance from that of the other forms. There is a large genital cone, grooved on its dorsal surface for the reception of the spicules. The spicules measure 0·7–0·75 mm. in length. They carry broad, transversely striated alæ proximally, but taper distally to slender filiform structures, which appear to be united for some distance from their tips. A little before the tip each spicule shows a constriction, and at the

Fig. 2.

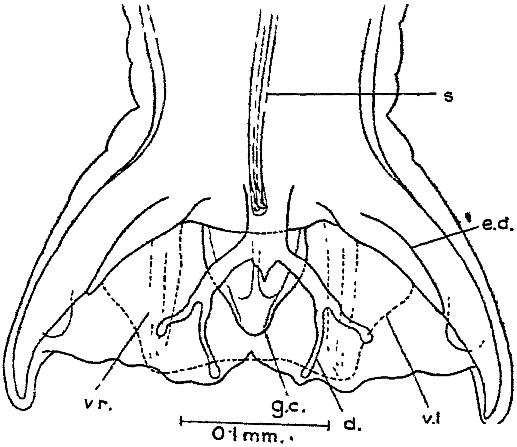


Macropostrongylus yorkei. Posterior portion of œsophagus (*oes.*) and anterior portion of intestine (*int.*), showing the paired granular structures (*g.*).

extreme end it is knobbed. The extremities of the two spicules appear to be enclosed in a common membrane, and are curved dorsally. No accessory piece has been found *.

Female.—Length 20–27 mm. Maximum thickness 0·9–1·07 mm. Cuticular striations about 5 μ apart. Distance from the anterior extremity to the posterior end of the œsophagus about 3·3 mm.; to the cervical papillæ 0·47 mm.; to the nerve-ring 0·8 mm. Excretory pore, as in the male, at about the level of the posterior end of the œsophagus. Length of buccal capsule about 0·09 mm. Diameter of the œsophagus, in the middle region, 0·12–0·15 mm.; that of its posterior swelling 0·2–0·26 mm. Tail 0·29–0·4 mm. in length, with a pair of caudal papillæ at about 0·062 mm. from the tip. Vulva situated at 0·7–0·85 mm. from the posterior extremity. Eggs thin-shelled, with granular contents, measuring 0·09–0·95 mm. × 0·06–0·0625 mm.

Fig. 3.



Macropostrongylus yorkei. Posterior end of male; dorsal view.
d., dorsal ray; *e.d.*, externo-dorsal ray; *g.c.*, genital cone; *s.*, spicules; *v.l.*, ventral lobe of bursa; *v.r.*, ventral rays.

In both sexes the cephalic papillæ are but little prominent. The mouth is surrounded by six slight lip-like prominences, two lateral and four submedian, each of which bears a papilla. The submedian papillæ are prolonged into short digitiform projections. In an end-on view of the mouth it may be seen that the cuticular border projects inwards, with a rounded contour, dorsally and ventrally, between the submedian "lips." The buccal capsule is capable of being much compressed laterally. Its diameter is consequently variable. The presence of a leaf-crown at its entrance is somewhat doubtful. In an end-on view, however, an appearance was seen as of a very large number of extremely minute elements just within the mouth-opening. The lateral walls of the buccal capsule, at its base, form a pair of shelf-like structures which project into the cavity, and, in the compressed condition, would tend to close the entrance to the œsophagus.

---

* In *M. australis* this structure is present as a distinct chitinoid nodule. In the single male of *M. macropostrongylus* which the writer has had the opportunity of examining it could not be made out with certainty.

At the junction of the œsophagus and intestine there is a peculiar structure (fig. 2) which is not mentioned by Yorke and Maplestone, but which appears to be a generic character, being present not only in this species but also in the genotype and in *M. australis*. This consists of a pair of large, solid, granular masses, apparently dorsal and ventral in position, in close connection with the anterior end of the intestine and embracing the posterior extremity of the œsophagus. The function of these organs is problematical, but in all probability they correspond to the cæca or solid appendices met with in this position in certain other groups of Nematodes, more especially in the subfamily Anisakinæ of the Ascaridæ.

Fam. Diaphanocephalidæ.

Kalicephalus novæ-britanniæ, sp. n. (Fig. 4.)

Host: "Snake."

Habitat. Intestine.

Locality. Rabaul, New Britain.

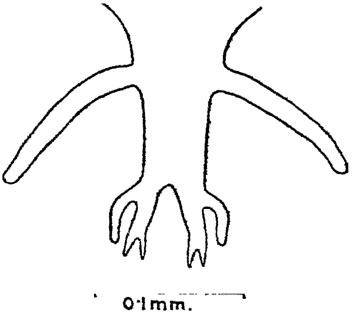
This species may possibly be identical with that collected by Willey from *Dipsadomorphus irregularis* in New Britain, and identified by Stossich (1900, 1901) as "*Sclerostomum*" *appendiculatum*, Molin. *Kalicephalus appendiculatus* was very briefly described by Molin, and none of the characters mentioned by him, with the exception of the total length and width of the male and female worms, are sufficiently precise to enable the species to be recognised.

The following are the measurements given by Molin (1861) for *K. appendiculatus*: length, male 3–7 mm., female

5–12 mm.; thickness, male 0·1–0·2 mm., female 0·2–0·3 mm. The hosts from which Molin's specimens came were all Brazilian snakes, and it may be doubted whether Stossich's identification of the material from New Britain with this species was correct. Stossich (1901) gives only a very brief description of the New Britain material, in which the only character of specific value is again the size of the worms (male 4 mm., female 7 mm.), while his figures are very diagrammatic and might represent almost any species of the genus. It is thought desirable, therefore, to give some description of the present material, and to regard it as representing a new species.

The males measure 6·5–7 mm. in length and 0·3 mm. in maximum thickness; the females 7–8 mm. and 0·38 mm. respectively. The diameter of the "head," at the base of the buccal valves, is 0·28–0·3 mm. in the male and 0·32–0·35 mm. in the female. The buccal valves measure 0·2–0·25 mm. in length. There is no leaf-crown (corona radiata) at the anterior border of the mouth. The dorsal gutter (duct of the dorsal œsophageal gland) is well developed, and extends for more than half the length of the buccal valves. The distance from the anterior extremity to the end of the œsophagus is 0·68–0·7 mm. in the male and 0·78–0·8 mm. in the female, the œsophagus itself, exclusive of the buccal valves, thus measuring 0·48–0·55 mm. in length. The maximum thickness of the œsophagus (in its swollen posterior portion) is 0·22–0·24 mm. in the male and 0·27 mm. in the female. The cervical papillæ are situated at about 0·1 mm. in front of the posterior end of the œsophagus.

Fig. 4.



Kalicephalus novæ-britanniæ. Dorsal ray of bursa.

The nerve-ring surrounds the constricted portion of the œsophagus at a point 0·38–0·4 mm. from the anterior extremity. The excretory pore is situated at 0·55–0·65 mm. from the anterior end.

The arrangement of the bursal rays of the male is that typical of the genus. The spicules, which have transversely striated alæ, measure about 0·4 mm. in length, and the accessory piece measures about 0·15 mm. The tail of the female is about 0·3 mm. long. The vulva, which has prominent lips, is situated at 2–2·4 mm. from the posterior end. The two uterine branches are opposed at first, but the posterior branch turns forward after a short distance to run parallel with the anterior branch. The eggs measure about 0·08×0·05 mm.

Fam. Spiruridæ.

Subfam. *SPIRURINÆ.*

Protospirura marsupialis, sp. n. (Figs. 5 & 6.)

Host : Opossum (probably *Trichosurus vulpecula* *).

Locality. Townsville, North Queensland.

This is a rather large form, at first sight suggesting an Ascarid. Unfortunately, all the specimens available are females. The largest measure about 65 mm. in length and 1·7 mm. in maximum thickness. The tail is bluntly rounded and measures 0·4–0·5 mm. in length. Each of the paired lateral lips is, as in other species of the genus, divided into three lobes. Each of these lobes bears on its inner surface a large median tooth and three or four smaller teeth on either side of the median tooth. These teeth are somewhat irregular in size and arrangement.

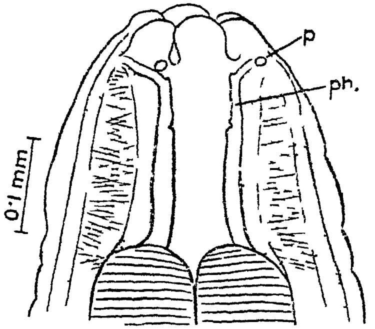
The mouth leads into a large, thick-walled pharynx, 0·3–0·34 mm. in length (measured from the extremity of the lips). The greatest width of the lumen of the pharynx is about 0·075 mm. The distance from the anterior extremity to the posterior end of the œsophagus is about 5·5 mm. The œsophagus is constricted a little behind its anterior end, at the point where it is surrounded by the nerve-ring. This is situated at 0·5–0·6 mm. from the anterior extremity of the worm. The cervical papillæ are situated at 0·65–0·7 mm., and the excretory pore at 0·85 mm., from the anterior end. There are no cervical alæ.

The vulva is situated at or somewhat behind the anterior third of the body. The eggs are very thick-shelled and measure on an average 0·055 × 0·035 mm.

---

* This determination was kindly made by Mr. M. A. C. Hinton, on the basis of a young animal from the pouch of the specimen in which the worms occurred.

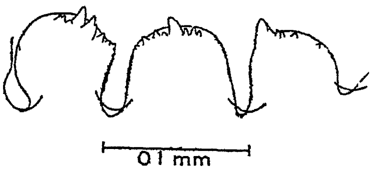
Fig. 5.



Protospirura marsupialis. Anterior end of female; lateral view. *p.*, submedian papilla; *ph.*, pharynx.

Of the nine species already assigned to the genus *Protospirura* (most of which occur in Rodents) the present form approaches perhaps most closely to *P. ascaroidea*, Hall, 1916.

Fig. 6.



Protospirura marsupialis. Inner aspect of the three lobes of one lip.

In size it also resembles *P. columbiana*, Cram, 1926. It differs from all the forms described, however, in the considerably greater length of the pharnyx, and on this ground, as well as the fact of its occurrence in a Marsupial in Australia, it is regarded (in spite of the absence of male specimens) as probably representing a new species.

Subfam. *Arduenninæ*.

Spirocerca heydoni, sp. n. (Figs. 7 & 8.)

Host: Native Cat (*Dasyurus* sp.).

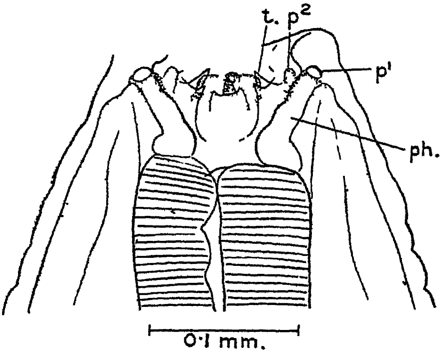
Habitat. Cysts in wall of stomach and intestine; also a few free in stomach.

Locality. Cairns, North Queensland.

This form is of considerable interest, since only one species of *Spirocerca* (sensu stricto) was previously known (*S. sanguinolenta* of the dog and other Canidæ), and also because it forms a link between this genus and *Streptopharagus*. The occurrence of a member of this group in a Marsupial is also interesting.

The males measure up to 34 mm. in length, but unfortunately no complete female specimens are available, all having been broken in collection. The maximum thickness is about 0·8 mm. in the male and 1·0 mm. in the female. The cuticular striations are about 4 μ apart. The diameter at the anterior extremity is 0·16–0·2 mm. The distance from the anterior end to the end of the œsophagus is 5·5–6·8 mm.; to the end of the anterior (muscular) portion of the œsophagus 0·55–0·7 mm.; to the nerve-ring and cervical papillæ about 0·35–0·4 mm. The pharynx is very similar in shape to that of *S. sanguinolenta* and measures 0·1–0·14 mm. in length. The cephalic pulp-masses and papillæ are exactly as in *S. sanguinolenta* (cf. Baylis, 1923), but, in addition to the six inner papillary terminations just within the mouth-opening, there are here six well-developed tricuspid teeth projecting into the wide anterior portion of the pharynx, very much as in certain species of *Streptopharagus*. Each tooth corresponds in position to one of the papillæ. The tricuspid form of the teeth is not very obvious when they are seen in an end-on view (fig. 8), but is more evident in a lateral view (fig. 7).

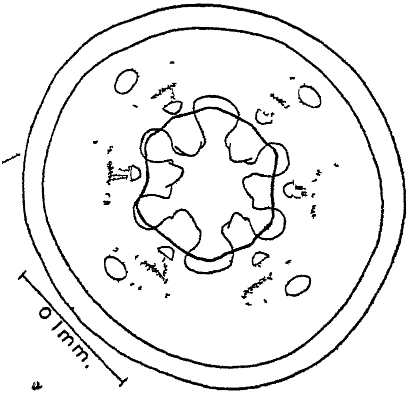
Fig. 7.



Spirocerca heydoni. Anterior end of male; lateral view.
p^1., outer, and *p^2*., inner termination of submedian papilla; *ph*, pharynx; *t*., tooth.

The tail of the male is 0·5 mm. long. The number and arrangement of the caudal papillæ appear to be precisely as in *S. sanguinolenta*. The left spicule measures 2·8–3·0 mm. in length, and the right spicule 0·6 mm. There is a small accessory piece, as in the genotype. In the female the tail is extremely short and blunt, measuring only 0·15 mm. The vulva is situated at about the middle of the œsophageal region (at 3·2–3·6 mm. from the anterior end). The eggs, which are cylindrical in shape, like those of *S. sanguinolenta*, and contain coiled embryos when ready for laying, measure 0·03–0·032 × 0·015–0·017 mm.

Fig. 8.



Spirocerca heydoni. End-on view of the mouth (female).

Fam. Cucullanidæ.

Cucullanus australiensis, sp. n. (Fig. 9.)

Host: "Reef eel" (? *Gymnothorax pictus*).

Habitat. Intestine.

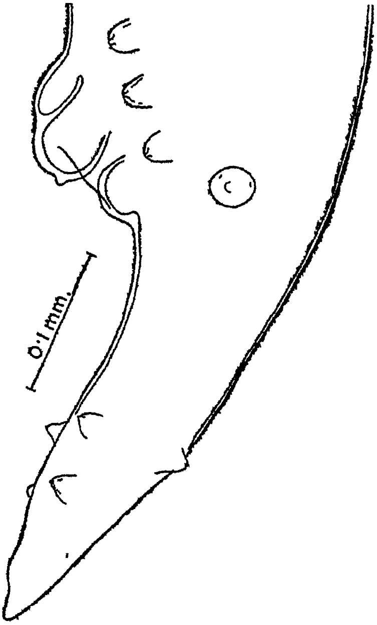
Locality. Townsville, North Queensland.

The species of *Cucullanus* are all so much alike, except in minute details, and many of them so inadequately described, that the determination of specimens is a matter of great difficulty. In case of doubt it appears best, even at the risk of increasing the synonymy, to treat forms from new hosts as new species.

The species here described is, in general appearance, qu typical. It has a length of 13–17 mm. in the male and 17–19 mm. in the female. The maximum thickness is 0·33–0·37 mm. The dorso-ventral diameter of the "head" is 0·23–0·24 mm. The distance from the anterior extremity to the end of the œsophagus is 1·3–1·35 mm.; from the same point to the end of the anterior division of the œsophagus 0·41 mm.; to the nerve-ring 0·35–0·38 mm.; to the cervical papillæ 0·75–0·85 mm. The cuticular striations are extremely fine.

The caudal end of the male (fig. 9) is provided with ten

Fig. 9.



Cucullanus australiensis. Posterior end of male; lateral view.

pairs of papillæ, of which six pairs are pre-anal, three forming a series near the cloaca on either side and three more anterior and more widely separated. Of these two lie between the group just mentioned and the pre-anal sucker, and one in front of the sucker. Of the postanal papillæ two pairs are subventral, one lateral and one subdorsal. The most anterior pair consists of very large papillæ, situated terally. Of the remaining three pairs, all of which are uated behind the middle of the tail, the most anterior subdorsal. All the papillæ are very prominent and nipple-like. The cloacal opening has a very prominent anterior lip, bearing posteriorly a transverse cuticular ridge, which, in a lateral view, suggests a median papilla. The spicules measure about 1·2 mm. in length, and the accessory piece 0·21 mm. The tail is 0·3 mm. long.

In the female the tail measures 0·48 mm. in length, and bears a pair of papillæ at 0·23 mm. from the extremity. The vulva is rather prominent and situated at 7–8 mm. from the posterior end. The eggs measure 0·09 × 0·048 mm.

REFERENCES.

BAYLIS, H. A. 1923. "On the Nematode Genus *Streptopharagus*, with some Remarks on the Genus *Spirocerca*." Trans. R. Soc. Trop. Med. and Hyg. xvi. pp. 486–497.

MOLIN, R. 1861. "Il Sottordine degli Acrofalli." Mem. R. Ist. Veneto, ix. pp. 427–633, pls. xxv.–xxxiii.

STOSSICH, M., in Shipley, 1900. "A Description of the Entozoa collected by Dr. Willey during his Sojourn in the Western Pacific." 'Zoological Results' (Willey), part v. pp. 531–568, pls. liv.–lvi.

——. 1901. "Contributo allo Studio degli Elminti." Boll. Soc. Adriat. Sci. Nat. xx. pp. 1–9, pls. i.–ii.

YORKE, W., and MAPLESTONE, P. A. 1926. 'The Nematode Parasites of Vertebrates.' London.

XXIX.—*New Indian* Tipulidæ (*Diptera*).

By F. W. EDWARDS.

(Published by permission of the Trustees of the British Museum.)

THE accompanying descriptions of nine new Indian Tipulidæ were prepared some years ago, with the intention that they should form part of a larger illustrated paper to be published in India. Time has not allowed the completion of the proposed paper, and, as I have had occasion to refer to some of these species in other works now in the press, it appears desirable to publish these descriptions without further delay. The types of the species collected by Mr. Mitchell were presented to the British Museum, through the kindness of the Secretary of the Bombay Natural History Society; the rest were presented by Col. S. R. Christophers, Director of the Central Research Institute, Kasauli.

Dicranomyia bifusifera, sp. n.

♂. *Head* blackish; rostrum ochreous. Palpi and antennæ black. Flagellar segments all shortly oval; verticils as long as the segments. *Thorax* blackish, lighter about the sutures, somewhat pruinose. *Abdomen* blackish, membranous areas pale. Hypopygium with the basal parts black, appendages pale ochreous with black tips; large and of complicated structure, which is essentially very similar to that of *D. complicata*, de Meij. (Holland), the chief difference being that the appendages are more elongate, the fleshy claspers in particular being very long and spindle-shaped, three times as long as the hooks; their ventro-basal appendage has a longer, more slender stem, and ends in a more definite rounded knob. *Legs* black, except for coxæ and base of femora which are light brown. *Wings* faintly greyish with dark veins; stigma faint. Sc_1 longer than *Rs*, its tip just above base of *Rs*; *r* at tip of R_1; Cu_{1a} just before base of discal cell. Discal cell rather short. Halteres dark.

Length of body 6 mm.; wing 6·5 mm.

Kashmir, 11,000–13,000 ft., exact locality not stated (*F. G. Mitchell*).

Limnobia kashmirica, sp. n.

♀. *Head* dark brown. Front nearly as broad as one eye. Antennæ dark brown; flagellum faintly ringed with lighter brown on the apical portion of the segments; these elongate-oval, basal segments very little stouter than the remainder; dorsal hairs longer than the segments. Palpi brownish, lighter in the middle. *Thorax* brownish ochreous; præscutum with a broad median darker brown stripe, its margins darker and concave. Scutum and pleuræ with darker markings. *Abdomen* dark brown, with narrow ochreous bands at the bases of the tergites; venter lighter. Ovipositor ochreous, valves rather long and slender. *Legs* brownish ochreous, coxæ and tarsi darker; femora black at the tips and with a faintly paler preapical ring. *Wings* faintly yellowish with a conspicuous dark grey pattern, as follows:—A blotch in cell *R* a little way from the base, and a larger one over the base of *Rs*, neither reaching the costa, others over the tip of *Sc*, on *r*, and on the posterior margin between the terminations of the veins; dark seams over the cross-veins and over the apex of R_{2+3} and M_1 and nearly the whole of R_{4+5}; streaks in the basal cells, and a patch crossing the two outer median cells. Sc_2 oblique, at tip of Sc_1 and close to tip of *Rs*; tip of R_1 not turned upwards, longer than *r*; Cu_{1a} at middle of discal cell. Halteres with the stem brownish; base of knob black, remainder whitish.

Length of body about 10 mm.; wing 9 mm.

Kashmir, 11,000–13,000 ft.; 1 ♀. Exact locality not stated (*F. J. Mitchell*).

This bears a considerable resemblance in structure, build, and markings to the European *L. flavipes*, F., differing chiefly in the unusual position of Cu_{1a} and in the markings of the apical part of the wing. Apparently its resemblance to the other described Oriental species of the genus is less close.

Trentepohlia (*Trentepohlia*) *obsoleta*, sp. n.

♂. *Head* blackish. Antennæ black except the basal half of the first segment, which is ochreous. Flagellar segments slender, almost cylindrical. Palpi black. Labium dark brown; the base of the proboscis ochreous. *Thorax* brownish, darker dorsally, the præscutum with an ill-defined dark brown median stripe; pleuræ lighter posteriorly. *Abdomen* rather dark brownish. Hypopygium short; claspers with the usual tooth on the outer side, placed well before the middle. *Legs* light brown; tips of femora, extreme base of tibiæ, tips of tibiæ (broadly), and the whole tarsi brownish yellow. Femora without spines. *Wings* almost hyaline; stigma light brown; veins all brownish; R_{4+5}, base of M_{1+2}, and Cu_{1a} narrowly seamed with grey. Venation practically as in *T. trentepohli*, Wied. Halteres light brown.

Length of body 5·5 mm.; wing 5·5–6 mm.

Pegu, Lower Burmah (*Col. S. R. Christophers*); 4 ♂.

Trentepohlia (*Trentepohlia*) *christophersi*, sp. n.

♀. *Head* as in *T. obsoleta*. *Thorax* light brownish, præscutum with three darker stripes. *Abdomen* brownish; penultimate segment blackish; last segment ochreous. Cerci very short. *Legs* uniformly ochreous; no femoral spines. *Wings* faintly greyish; veins all dark except the tip of R_1 and the greater part of R_{2+3}, which are yellow; tip of wing rather smoky, but leaving the cell R_2 mostly clear; cross-veins, R_2, and *Cu* seamed with grey. Venation almost as in *T. trentepohli*, Wied., but Cu_{1a} is almost in a line with the first section of M_{1+2}. Halteres light brownish.

Length of body 6 mm.; wing 5·5 mm.

Rangoon (*Col. S. R. Christophers*); 1 ♀.

Allied to *T. trentepohli* (Wied.), differing in the rather broader wings with less conspicuously darkened tips.

Trentepohlia (*Mongoma*) *bombayensis*, sp. n.

Head blackish. Antennæ black; flagellar segments rather elongate-oval. Palpi black. Labium ochreous. *Thorax* dark brownish; pronotum and an indistinct median stripe on the præscutum darker; pleuræ rather lighter. *Abdomen* dark brown above, lighter beneath. Male claspers long and slender, with a very slight notch on the outer margin beyond the middle; tip not enlarged. Female cerci of moderate length, much curved. *Legs* rather dark brown; tips of femora indistinctly, tips of tibiæ and the whole tarsi rather conspicuously lighter, but not white. All femora without small spines at the base beneath in either sex. *Wings* greyish-tinged, unmarked, veins dark brown. Venation almost exactly as in *M. fragillima*, Westw. Halteres dark.

Length of body and of wing, ♂ 5·5, ♀ 7·5 mm.

Bombay (*Col. S. R. Christophers*); 1 ♂, 1 ♀.

Allied to *T. pallidiventris*, Brun., and *T. obscura*, de Meij., differing from both in the long discal cell, and from the former in the shape of the male claspers and the absence of spines beneath the hind femora of the female.

Trentepohlia (*Mongoma*) *retracta*, sp. n.

♂. *Head, thorax*, and *abdomen* coloured as in *T. bombayensis*. Hypopygium shorter; claspers shorter, with a definite tooth on the outer margin, tip rather broader. *Legs* dark brown; the extreme tip of the first and the whole of the remaining tarsal segments whitish. Hind femora with a few minute spines towards base beneath. *Wings* greyish, unmarked except for the faint stigma, and fainter dark clouds on Cu_2 and the bend of Ax; veins brown, mostly rather slender. Cell *2nd* M_2 square at the base, which is placed well beyond that of cells M_1 and M_3. Cu_{1a} immediately before the base of the discal cell; Cu_2 short, ending in An fully three times its own length before the tip of this vein. Halteres dark.

Length of body 5·5 mm.; wing 5·5 mm.

Rangoon (*Col. S. R. Christophers*); 1 ♂.

By the greatly retracted position of Cu_2 this is very distinct from most other members of the subgenus.

Molophilus nilgiricus, sp. n.

♂. *Head* ochreous. Antennæ short; scape and base of flagellum ochreous, the rest darkened. Palpi blackish. *Thorax* ochreous; postnotum and upper part of pleuræ darker. *Abdomen* rather dark brownish; hypopygium lighter. A single long slender clasper, curved and slightly blackened at the tip, and set between two rather long and pointed projections of the side-piece, the upper of which is longer. Penis long and slender. *Legs* uniformly light ochreous. *Wings* with brownish-ochreous hair. Venation normal; *Ax* ending opposite Cu_{1a}. Halteres ochreous.

Length of body 3 mm.; wing 3·8 mm.

Nilgiri Hills, ix. 1915 (*Col. S. R. Christophers*); 1 ♂.

Related to *M. inconspicuus*, Brun., which differs in the hypopygium as follows:—Dorsal to the long, slender, curved clasper, instead of a long pointed lobe of the side-piece, there is a short black second clasper, very slightly hairy at its tip.

Bæoura nigromedia, sp. n.

♀. *Head* pale grey, with a little short yellowish hair. Front very broad. Antennæ and palpi black; flagellar segments rather elongate-oval; verticils about as long as the segments, pubescence short. *Thorax* bare, dull greyish, rather pruinose, pronotum (which is rather large and flat) and scutellum more ochreous, middle part of præscutum shading to dull black in front. *Abdomen* dark brownish above, lighter beneath, with a little short pale hair. Ovipositor short and fleshy, anal cerci rounded. *Legs* with the coxæ and bases of femora ochreous, remainder of legs blackish. *Wings* nearly hyaline; veins dark, with short and inconspicuous hair. *Sc* ends at about two-thirds *Rs*; *Rs* nearly straight; *r* near base of R_2, which is angulated; second section of R_2 only about half as long as R_3, and curved slightly upwards; R_3 and M_1 somewhat approximated to R_{4+5} at the tip; base of R_{4+5} much shorter than *r–m*; discal cell open; Cu_{1a} far beyond fork of *M*, and just before middle of stem of cell M_3; *Ax* short and almost straight, slightly convex upwardly; anal angle distinct. Halteres brownish; knob darker.

Length of body about 3 mm.; wing 4 mm.

Kasauli, 1. ix. 1921 (*Col. S. R. Christophers*); 1 ♀.

Four or five Oriental species of this genus are now known, only one of which (*B. distans*, Brun.) has been found in India; this differs from the new species in its black thorax and other details.

Tipula mitchelli, sp. n.

♂. *Head* dark greyish above, with a dark brown median line; face, rostrum, and under surface more ochreous. Nasus short. Antennæ with the scape ochreous-brown; flagellum black, fully twice as long as the head and thorax together. All flagellar segments except the first greatly enlarged at the base beneath, with long verticils; apical part of segments slightly concave above and convex beneath; pubescence dense and erect, about as long as the minimum diameter of the segments. Palpi blackish. *Thorax* with the integument ochreous, except the præscutum and scutum, which are mainly blackish; all heavily dusted with rather light grey; pronotum and mesonotum with a continuous dark brown median line, broadest and most distinct on the præscutum, which also has a pair of very narrow dark lines at the margins of the broad central stripe. Whole thorax practically bare. *Abdomen* ochreous, with an indistinct and more or less interrupted median dark line; sides of first two tergites also more or less darkened. Ninth tergite a concave shining dark brown plate, blackened round its edges and finely serrate along its posterior margin. Eighth sternite simple, bare. Outer claspers of moderate length, straight, somewhat broadened in the middle. *Legs* ochreous; tips of femora, tibiæ, and first tarsal segments narrowly darkened, last three or four tarsal segments black. *Wings* brownish, rather indistinctly marmorated, the most obvious pale area being a spot a little beyond the middle of cell *M*; base of cell *An*, area before and beyond the stigma and outer part of cell R_{4+5} also obscurely paler; stigma and base of *Rs* somewhat darker. *Rs* long, four times as long as R_{2+3}; R_2 complete, rather long; cell M_1 about three times as long as its stem; *m–cu* short but distinct; cell *Ax* rather broad, anal angle distinct. Halteres with the stem light, knob somewhat darkened.

Length of body 14 mm.; wing 17 mm.; antennæ 9 mm.

Kashmir, 11,000–13,000 ft.; 2 ♂. Exact locality not stated (*F. J. Mitchell*).

Though resembling several other species in its wing-markings, this species seems rather distinct by the length of the antennæ and the coloration of the thorax. It is related to the North European *T. excisa*, Schum.

XXX.—*Crane-flies collected by Dr. P. A. Buxton in the New Hebrides.*

By F. W. Edwards.

(Published by permission of the Trustees of the British Museum.)

A SMALL collection of crane-flies obtained by Dr. P. A. Buxton in the New Hebrides in 1925 contained fifteen species, eleven of which appear to be new and are described below. The whole of the material has been presented by the collector to the British Museum through the Imperial Bureau of Entomology. This is the first considerable collection of crane-flies which has been made in the New Hebrides—in fact, so far as I can discover, only one Tipulid has been recorded from the islands hitherto (*Epiphragma hebridensis*, Alexander, Ann. & Mag. Nat. Hist. (9) xiii. p. 44, 1924).

Dicranomyia (*Alexandriaria*) *semirufa*, sp. n.

♂. *Head* black, somewhat shining. Front rather broad, yellow, with heavy silvery pruinescence. Antennæ black; flagellar segments rounded, with short verticils. Mouth-parts yellowish. *Thorax* mainly shining black, a large dull black spot on each side of the præscutum, occupying the margin between the suture and the pseudosuture. Upper margin of pleuræ brownish. *Abdomen* conspicuously light red, the last segment and hypopygium black. Fleshy claspers large; rostral spines moderate. *Legs* with coxæ blackish, trochanters brown, rest missing. *Wings* rather dark grey; stigma hardly indicated. *Sc* ending much before *Rs*, which is much shorter than basal section of R_{4+5}. R_1 running straight to costa, *r* at its tip. Cu_{1a} almost at right angles to *M*, placed before base of cell M_3. Halteres brownish.

Wing-length 4 mm.

Espiritu Santo I., Hog Harbour, 18.v.1925; 1 ♂.

Readily distinguished from all other species by the black thorax and red abdomen.

Dicranomyia (*Idioglochina*) *vilæ*, sp. n.

♂. *Head* dark brownish ochreous, heavily pruinose. Mouth-parts dark brown, antennæ lighter; flagellar segments strongly produced below, more so than in *D. tusitala*; necks distinct, but shorter than the segments themselves. *Thorax* brownish ochreous, pruinose; traces of three darker brown præscutal stripes. *Abdomen* brownish, darker apically; hind margins of tergites narrowly pale. Hypopygium much as in *D. tusitala*, but ninth tergite with only a slight, though broad, V-shaped emargination. *Legs* light brownish ochreous. *Wings* quite unmarked, whitish, veins all pale. Venation as in *D. tusitala*; *Sc* ending far before base of *Rs*, the distance greater than the length of *Rs*; *Rs* nearly straight, rather longer than basal section of R_{4+5}; R_{2+3} curved near base, so that the cell R_1 is large; discal cell broad and longer than cell M_3. Halteres ochreous.

Wing-length 7 mm.

Vila, 10.vii.1925; 1 ♂.

Dicranomyia (*Idioglochina*) *parvimacula*, sp. n.

♂. *Head* rather light ochreous, including mouth-parts and antennæ; flagellar structure as in the last species, except that the necks seem rather longer. *Thorax* rather light ochreous, a little darker above, with slight pruinescence; a small dark brown spot immediately above the root of each wing. *Abdomen* uniformly light ochreous; hypopygium as in the last. *Legs* light ochreous. *Wings* clear, veins pale. Rs nearly straight, shorter than basal section of R_{4+5}; R_{2+3} straight; discal cell much longer than broad, longer than cell M_3. Halteres pale ochreous.

Wing-length 5·5 mm.

Espiritu Santo I., Hog Harbour, viii. 1925; 1 ♂.

Dicranomyia (*Idioglochina*) *obesula*, sp. n.

♀. Blackish brown, without markings; shoulders, wing-base, postnotum, venter, tip of abdomen, coxæ, trochanters, and bases of femora lighter. Thorax and abdomen dull, slightly pruinose. Abdomen short and broad, the ninth segment and cerci together not much shorter than the rest of the abdomen. *Wings* dark grey, veins all dark, the whole of cell R_1 slightly darkened. Sc not quite so short as in the last two species, the distance from its tip to the base of Rs scarcely equal to the length of the latter vein. Rs and basal section of R_{4+5} both gently curved, the first a little shorter than the second. R_{2+3} straight. Discal cell larger and slightly longer than cell M_3.

Wing-length 5·5 mm.

Tongoa Is., 12. vii. 1925; 1 ♀. Also 1 ♀ from Banks Group, 1923 (*A. E. Ridsdale*).

Dicranomyia buxtoni, sp. n.

♀. *Head* dull black; frons silvery, rather narrow above. Mouth-parts and antennæ black; flagellar segments stout, scarcely longer than broad, with short but distinct necks; last two or three segments more oval, the terminal segment with a short point; verticils short, dorsal hair rather longer. *Thorax* wholly shining black; pronotum small. *Abdomen* dark brown, valves of ovipositor ochreous. Cerci of peculiar shape, broad, thick, and convex outwards. *Legs* blackish except for the ochreous coxæ, trochanters, and bases of femora. *Wings* nearly hyaline, veins all dark, stigma oval, brown. Sc reaching to mid-length of Rs, Sc_2 at its tip. Rs originating in middle of wing, rather strongly curved, twice as long as the long first section of R_{4+5}. Tip of R_1 turned up and shorter than *r*. R_{2+3} gently curved. Discal cell open, Cu_{1a} at its base, cell M_3 rather long. Anal angle slight. Halteres black, base of stem yellow.

Wing-length 4 mm.

Espiritu Santo I., Hog Harbour, 18. vi. 1925 ; 8 ♀.

Apparently belongs to the *morio* group, from most of which it is distinguished by the open discal cell and rather long subcosta.

Thrypticomyia auripennis, Skuse, var.

Espiritu Santo I., Hog Harbour, 14. viii. 1925 ; 2 ♂, 1 ♀.

These specimens differ from typical *auripennis* (as represented in the British Museum by specimens from South Queensland) in having less than the basal half of the first tarsal segments white, and the rostral spines of the male hypopygium less widely separated and placed on less distinct tubercles.

Doaneomyia altitarsis, sp. n.

Differs from *D. tahitiensis*, Alex., as follows:—Tibiæ with the white base almost as extensive as the white apex, the black middle part occupying less than half the total length of each tibia. Tarsi wholly white. Fleshy claspers much longer than broad, instead of broader than long.

Espiritu Santo I., Hog Harbour, 15–18. vi. 1925 ; 2 ♂ (incl. type). Vila, 31. vi. 1925 ; 1 ♂.

Libnotes notata, v. d. W.

Tanna, 10. ix. 1925 ; 2 ♂.

Except that *r* is straight instead of curved, these specimens answer rather well to Alexander's description of *L. solomonis*. It is probable that *L. solomonis*, Alex., *L. howensis*, Alex., and *L. restricta*, Alex., are not more than varieties of *L. notata*, v. d. W.

Libnotes punctipennis, de Meij.

Espiritu Santo I., Hog Harbour, vii. 1925 ; 1 ♂. Tanna, 10. ix. 25 ; 1 ♀.

Libnotes hebridensis, sp. n.

Closely allied to *L. fijiensis* (Alex.), differing as follows:—Eyes narrowly separated. Præscutal stripes all equally broad. Abdominal tergites with the hind margins pale.

Ventral process of hypopygium with a tuft of three or four long spine-like pale bristles in the middle. Clasper larger, almost rectangular in shape, the two terminal points being very widely separated. *Rs* rather shorter and less strongly curved.

Wing-length 7·5 mm.

Ambrim Is., 22. vi. 1925; 1 ♂.

Libnotes inusitata, sp. n.

♂. *Head* black, including scape of antennæ and mouth-parts. Eyes touching for a considerable distance both above the antennæ and below the rostrum. Flagellum light brownish, segments rather elongate-oval, dorsal hairs about twice as long as the segments. *Thorax* light ochreous, rather shining; pronotum and a median stripe from front to near middle of præscutum blackish. *Abdomen* light ochreous. Hypopygium: ninth tergite with shallow emargination; fleshy claspers more than twice as long as the side-pieces, elliptical in shape; rostrum rather large, with one moderately long and stout spine near its tip, the second spine hair-like. *Legs* brownish, femora darker at the tip, coxæ and trochanters ochreous. *Wings* hyaline, veins dark; stigma small, dark brown. Venation as in *L. familiaris*, O.-S. Halteres with ochreous stem and dark knob.

Wing-length 6·5 mm.

Espiritu Santo I., Big Bay, 1. viii. 1925; 1 ♂.

Nearly allied to *L. familiaris*, O.-S., but, according to specimens I have so determined from the Philippines, Osten-Sacken's species differs in having small male claspers. *L. signaticollis*, v. d. W. (*familiaris*, de Meij.), has the eyes well separated.

Helius (*Eurhamphidia*) *mirandus*, sp. n.

♀. *Head* dull ochreous, the narrow front dark grey. Rostrum rather longer than the head, brownish-ochreous, darker above. Antennæ brownish, second segment lighter; flagellar segments, except the first two or three, elongate-oval. *Thorax* shining ochreous. A small dark brown spot on each side of the præscutum in front of the suture, and a pair of short posterior stripes in contact with the dark brown scutal lobes. Postnotum (pleurotergite and mediotergite) blackish; a dark brown stripe across pleuræ. *Abdomen* ochreous, segments 3–7 broadly dark brown at the base. Cerci long, slender, pointed. *Legs* ochreous, tips of femora black, tips of tibiæ more narrowly so. *Wings* with a slight yellowish tinge; base, costa, and radius yellow; thoracic squama black. A dark grey band from arculus to hind margin, extending some way along cell *Cu*; a large dark spot over origin of *Rs*, and another on the margin below it; a dark band from the stigma to hind margin, including the whole circumference of the discal cell, but leaving its interior clear; wing-tip rather broadly dark, but leaving a clear space close to tip of cell R_5. *Sc* ending above apex of *Rs*, which is long; R_{2+3} rather short, ending not far from tip of R_1; *r–m* absent, the large discal cell in contact partly with *Rs* and partly with R_{4+5}; cells R_5 and M_3 with their bases level; Cu_{1a} placed just before middle of discal cell. Halteres ochreous.

Wing-length 6·5 mm.

Espiritu Santo I., Big Bay, 1. viii. 1925; 1 ♀.

Among previously described species the only one which needs comparison with this remarkably distinct *Helius* is *H. mirus*, Edw. (Borneo), which is smaller and has different wing-markings; its discal cell is in contact with *Rs*, but not with R_{4+5}.

Trentepohlia (*Mongoma*) *galactopus*, sp. n.

♂. *Head* blackish, including antennæ and palpi; rostrum ochreous. Flagellar segments nearly cylindrical, over twice as long as broad, the first a little longer than the rest, hairs short. *Thorax* dark brown above, scarcely shining; pleuræ ochreous; no markings. *Abdomen* dark brown above, pale beneath. *Legs* with coxæ and trochanters ochreous; femora dark brown, the tip (1 mm.) clear white; tibiæ dark brown, about 0·5 mm. at the base obscurely whitish, and 2 mm. at tip clear white: tarsi wholly yellowish white. Front legs missing. Hind femora with a few scattered bristly spines beneath. *Wings* as in *T. australasiæ*, Skuse, except that R_{4+5} is almost straight (as usual) and Cu_2 joins *An* about half its length before the wing-margin. Halteres dark brown.

Wing-length 7 mm.; body 7 mm.

Espiritu Santo I., Big Bay, 31. vii. 1925; 1 ♂.

Closely allied to *T. australasiæ*, Skuse (Queensland), but, apart from the venational difference mentioned above, it is distinguished by its uniformly coloured tarsi. *T. samoensis*, Alex., and *T. pacifica*, Alex. (Samoa), also differ in several respects, though belonging to the same group. *T. fragillima*, Westw. (Africa), is another member of the group.

Gonomyia (*Lipophleps*) *naiadifera*, sp. n.

Head yellow. Rostrum very short, black, but the labella yellowish. Palpi black. Antennæ with the first three segments orange, the next one or two brownish, the rest black. *Thorax* brownish-orange above, pronotum and margins of præscutum yellow. Pleuræ yellow, a blackish stripe, rather broad but not very sharply defined, extending from neck to base of abdomen; a second dark stripe across sternopleura. No obvious pruinescence on any part of thorax. *Abdomen*: tergites yellow, hind margins narrowly black; traces of an ill-defined longitudinal dark stripe. Sternites of 2 and 3 black, 4–7 each with broad basal half yellow, apical half black. *Hypopygium*: side-pieces small, the apical finger-like projection twice as long as the basal part. Dorsal clasper simple, finger-like, with a long subapical hair. Ventral clasper with enormously swollen base, which is half as long again as the basal part of the side-piece and rather broader, apical part long, sickle-shaped, the sharp tip blackened. Ædæagus of symmetrical form. Parameres fused, forming an organ shaped like the body and hood of a cobra, the hood covering the end of the penis; no part blackened. *Legs* with coxæ and trochanters ochreous, the rest rather dark brown, tips of femora scarcely swollen and not darker than the rest. *Wings* with faint grey clouds along most of the veins, more extensive towards costa and wing-tip, and slightly darker over the cross-veins; stigma oval, dark grey, conspicuous. Veins all brownish, including costa. *Sc* ending far before base of *Rs*. *Rs* rather short, curved; R_{2+3} also short and curved, as long as *Rs*, the two veins together forming almost a perfect arc, with the stigma in the middle. Discal cell small, Cu_{1a} just before its base. Halteres yellow.

Wing-length 4 mm.

Espiritu Santo I., Big Bay, 31. vii.–1. viii. 1925; 1 ♂, 2 ♀.

A rather distinct species, the colouring of thorax and abdomen being unusual. The wing has some resemblance to *G. nebulosa*, de Meij. (Java).

Nephrotoma sp.

One damaged specimen. Pentecost Is., 20. vi. 1925.

XXXI.—*Diptera Nematocera from the South Pacific collected by the 'St. George' Expedition*, 1925. By F. W. Edwards.

(Published by permission of the Trustees of the British Museum.)

The collection of Nematocera brought back by the members of the 'St. George' expedition is small, but, nevertheless, of much interest on account of the extreme scantiness of our knowledge of the Dipterous fauna of most Pacific islands. Twenty-one species are represented in the collections from the Society and Marquesas Is. and Rapa, and among these all previously recorded species are included, with the exception of *Culex atriceps*, Edw., recently described from Tahiti. Of the remainder, seven species are believed to be new, and are herein described as such. All the specimens from the Society and Marquesas Is. were collected by Miss L. E. Cheesman; those from Rapa by Mr. C. L. Collenette. The types of the new species are in the British Museum.

Tipulidæ.

Doaneomyia tahitiensis, Alex.

Society Is.: Tahiti, Vallée de Ste. Amélie, 8. iii.; Papenoo, 13. iii. 1925; R. Vaitepiha, Tautira, 9. vii. 25; N. Raiatea, 2000 ft., 1. vi. 25.

All specimens taken in shade, numerous high up in heads of gullies, where water flows over precipitous rocks. There is some variation in the amount of white at the base of the tibiæ, one or two specimens having the basal white area over half as long as the apical, though not quite so extensive as in the allied *D. fijiensis*, Alex. It is possible that a long series might prove that the differences between the two supposed species of this genus are covered by individual variation.

This is the only endemic Nematocerous fly hitherto recorded from Tahiti.

Dicranomyia sordida, Brun.

Society Is.: Tahiti, 8–10. iii. and 5. v. 25; Lake Vaihiria, 19 vii. 25.

The specimens agree with others in the British Museum from Assam and Pahang, and also with examples from Fiji determined by Dr. C. P. Alexander as *D. illingworthi*, Alex. Further, according to the description and a figure of the wing kindly supplied me by the author, it would seem most probable that *D. rapæ*, Alex., from Rapa Island, is also the same species, the range of which evidently extends from India through the Malayan region far into the Pacific; Alexander has also recorded it from North Queensland. The species does not seem to have reached the Sandwich Is., but some fragmentary specimens taken by Miss Cheesman on the Marquesas (Fatu-Hiva and Tahuata) are possibly *D. sordida*, though with a shorter *Rs*.

Dicranomyia sancti-georgii, sp. n.

Entirely blackish brown, including the legs, wings, and halteres, the only light brown parts being the trochanters and valves of the ovipositor; thorax and abdomen scarcely shining. Flagellar segments rounded, the last one or two shortly oval, verticils very short. Thorax without definite pruinescence. Hypopygium: ninth tergite slightly emarginate in middle; dorsal clasper very thick; ventral clasper rather small, broader than long, rostral spines short and hair-like, scarcely differentiated; ventral process of side-piece short but very broad; no accessory appendages. Stigma very little darker than the ground-colour of the wing. Sc_2 close to tip of Sc_1; Rs nearly straight, scarcely twice as long as first section of R_{4+5}; R_{2+3} sharply turned up at extreme tip; Cu_{1a} at base of discal cell.

Wing-length 6·5–8·5 mm.

Rapa Is., iv. 1925 (*C. L. Collenette*); 2 ♂, 4 ♀.

Dr. C. P. Alexander, to whom I submitted a specimen of this species, gave his opinion that it is related to the Hawaiian *D. stygipennis*, Alex., though with quite different hypopygium. The only other crane-fly recorded from Rapa is *Dicranomyia rapæ*, which, as stated above, is probably synonymous with the widespread *D. sordida*, Brun.

Thrypticomyia dichromogaster, sp. n.

Very similar to *T. auripennis*, Skuse, *T. subsaltens*, Alex., and allied species, but differs from all in its distinctly banded abdomen. The following are the chief diagnostic characters:—Abdomen with the second tergite light brown with a dark median band; tergites 3–6 each dark brown on about the basal half, light brown apically. Hypopygium with the fleshy claspers large, about twice as long as the side-piece; rostrum short and directed towards the head; two very short but rather stout spines placed close together. Basal half or more of first tarsal segment dark. Wings not darkened at the tip; the two transverse veinlets in the stigma separated by not more than the length of one of them.

Society Is.: Tahiti, 8–13. iii. 1925, in shade near water.

The species of *Thrypticomyia* (in the restricted sense in which the name has recently been employed by Alexander) are very closely allied, and are perhaps to be regarded as geographical races only, since, so far as we know, their ranges do not overlap. *T. dichromogaster* resembles *T. seychellarum* in venation, but in that species the fleshy clasper of the male is small, with long pointed rostrum. *T. auri-*

the stigma widely separated, though, on the other hand, they resemble the new species in having large fleshy claspers; in *T. auripennis* the spines on the rostrum are short, stout, straight, and placed far apart; in *T. subsaltens* they are long, slender, and much curved.

Libnotes perkinsi (Grim.).

SOCIETY Is.: Tahiti, 10. iii. 25, among bracken on dry coast-hills, 2000 ft.; Raiatea, 16. v. 25, at light at sea-level.

Styringomyia didyma, Grim.

SOCIETY Is.: Raiatea, sea-level, 14. v. 25; very numerous among rushes on shore.

This species and the last are both widely-spread throughout the Pacific.

Gonomyia (*Lipophleps*) *flavidapex*, sp. n.

♀. *Head* dull black, a large yellow spot above base of antennæ. Antennæ and mouth-parts black; flagellum slender, only the first five or six segments distinct, these elongate-oval; verticils not much longer than the segments, the dorsal hair not remarkably long. *Thorax* brightly shining black; posterior division of pronotum brownish; scutellum and median depression of scutum dull black. *Abdomen* dull black; segment 2 with a broad shining band at the base, ovipositor reddish. *Legs*: front and hind femora orange, with the end fourth black; tibiæ black with a very broad pale yellow ring before the middle; tarsi black. Middle legs black, except for the basal fifth of the femora, which is dull orange. All coxæ and trochanters shining black. *Wings* broad, blackish, cross-veins still darker; a small whitish patch across the middle of the basal cells, and another below it above the tip of *Ax*; a narrow yellow crescent round the tip of the wing. *Sc* extending a little beyond base of *Rs*, Sc_2 close to its tip. Cell R_{4+5} contracted at tip as usual; Cu_{1a} at base of discal cell; R_{2+3} long and nearly horizontal, cell R_{2+3} therefore less trumpet-shaped than in the typical species of the subgenus. Halteres black.

Wing-length 7 mm.

SOCIETY Is.: Tahiti, 10. iii. 25; 7 ♀ (incl. type). Lake Vaihiria, 19. vii. 25; 1 ♀.

This fine species is quite unlike any other members of the genus known to me, and superficially resembles a small *Eriocera*.

Gonomyia (Lipophleps) metallescens, sp. n.

♀. *Head* dull black; clypeus and first antennal segment orange; remainder of antennæ and palpi black; structure as in the last species. *Thorax*: anterior division of pronotum bright yellow, posterior division dull black. Præscutum and scutum brightly shining blue-black, submetallic; middle part of scutum and the whole scutellum dull black. Pleura dull black above, lower part mostly occupied by a shimmering blue-grey spot. *Abdomen* dark brown, slightly shining, posterior margins of segments and ovipositor ochreous. *Legs*: front coxæ and trochanters ochreous, rest of front legs missing. Posterior coxæ black; trochanters brownish; femora brownish ochreous, tips narrowly darkened; tibiæ and tarsi dark. *Wings* with a slight yellowish tinge, veins dark. A rather broad dark brown seam over the cord and along the whole of *Cu*, also filling base of cell *An*; base of *Rs* and tip of discal cell also slightly darkened. Venation almost as in the last species, but *Sc* ending above base of *Rs*. Halteres with blackish stem and bright yellow knob.

Wing-length 7 mm.

MARQUESAS Is.: Nuka-Hiva; 2 ♀.

In spite of the very different colouring, this is evidently nearly related to the last species.

Gonomyia (Lipophleps) sp.

MARQUESAS Is.: Hiva-oa, one fragmentary specimen.

A small species somewhat allied to *G. nebulosa*, de Meij., but unfortunately too damaged for description.

Gonomyia (Lipophleps) sp.

SOCIETY Is.: N. Raiatea, 1000–1500 ft.; 1 ♀.

A small plain-winged species without pleural stripe. In the absence of the male it does not seem advisable to name it.

Culicidæ.

Aëdes (Stegomyia) variegatus (Dol.), var. *pseudoscutellaris*, Theo.

SOCIETY Is.: Tahiti, 15. iv. 25; Tautira, 7. vii. 25; Bora Bora N., Fanui Valley, 20. vi. 25; Bora Bora S., sea-level, 22. vi. 25; Raiatea, 14. v.–1. vi. 25. Extremely numerous far inland at heads of small gullies; less numerous near coasts. TUAMOTU Is.: Fakarava. MARQUESAS Is.: Hiva-oa and Tahuata. Numerous near the coast.

This is the most abundant mosquito of the Pacific, breeding chiefly in coconut-husks. Miss Cheesman records it as breeding in cracks of trees, rat-holes, flower-buds of coconut, etc.

Aëdes (*Stegomyia*) *argenteus* (Poir.).

Society Is.: Bora Bora S., sea-level, 22. vi. 25; Tahiti, 15. iv. 25; Raiatea, 14–16. v. 25.

Culex annulirostris, Skuse.

Society Is.: Raiatea, 16. v. 25; 1 ♀. Tuamotu Is.: Fakarava; 1 ♀.

The specimens are in poor preservation, but seem referable to this species rather than to *C. sitiens*.

Culex fatigans, Wied.

Society Is.: Tahiti and Raiatea. Marquesas Is.: Tahuata and Futa-Hiva. Rapa I.: reared from larvæ in crater-lake.

Simuliidæ.

Simulium buissoni, Roub.

Marquesas Is.: Nuka-Hiva, numerous specimens.

Society Is., Tahiti: Mae-Mae Valley, 16. iii. 25; Tautira, 9. viii. 25.

A small blackish species; legs mainly dark, the tibiæ narrowly pale at the base, and the first hind tarsal segment largely pale; rather scanty yellowish pubescence on mesonotum and abdomen, none on pleural membrane or mesosternum. The black antennæ have eleven segments, the terminal segments rather blunt and not much longer than the penultimate. Abdominal tergites 3–5 rather small and dull, 6–8 larger and somewhat shining. Radius moderately hairy throughout, hair on stem-vein dark. Halteres dark brownish.

I am unable to distinguish the specimens from Tahiti from those from Nuka-Hiva; if they are, in fact, conspecific it is probable that the species will be found to have a much wider range.

Small immature larvæ taken on Tahiti may belong to this species, they show no peculiarities worth recording. Regarding the occurrence of this species the collector writes:—

"*S. buissoni*, the 'no-no' of the Marquesans, occurs in incredible numbers in the Taipi Valley, Nuka-Hiva. In the cover all exposed flesh in black masses, setting up unbearable irritation and producing much swelling and inflammation of the parts attacked. Not numerous in the Mae-Mae Valley, Tahiti, in March, but very troublesome on the river Vatepiha in July, when it assailed one in clouds, and only bit when under one's clothing. It is noticeable that whereas in the Taipi Valley it haunted the shores at the mouth of the valley and even came out to sea, attacking the passengers of incoming ships, in the Vaitepiha Valley it remained near the river and was not found on the coast."

Simulium cheesmanæ, sp. n.

♀. *Head* dull dark grey; pubescence of frons and face golden; no distinct hairs mixed with the pubescence. Front rather wide and much widened above. Antennæ 11-segmented and almost entirely ochreous, only the tip slightly darker in some specimens; last segment rather pointed and nearly twice as long as the penultimate. *Thorax* dull blackish grey, with a slight ochreous tinge on the shoulders. Scutum without a trace of longitudinal stripes; pubescence golden, not very dense. Pleural membrane and mesosternum bare. *Abdomen* entirely dull, dark grey. All tergites large, much broader than long; pubescence and basal fringe golden. *Legs* mainly orange; hind tibiæ more or less darkened at the tip; anterior tarsi blackish except towards base of first segment; hind tarsi with the first segment yellow with blackish tip; second segment yellowish at base; rest black. Front tarsi very slightly flattened. Hind tarsi of normal structure, the produced tip of the first segment about half as deep as the segment; second segment deeply excised near base. Claws with moderately large basal projection. *Wings* normal. Hair on stem-vein dark; radius hairy throughout. Halteres yellow.

Wing-length 2·5–3·5 mm.

Society Is.: Tahiti, 8. iii. and 5. v. 25, in valley-head above Papeete and on hills above Papenoo; 4 ♀. Two additional ♀ ♀ taken at Lake Vaihiria, 20. vii. 25, are smaller and have the tips of all the tibiæ and of the hind femora darkened; these possibly represent another species. *S. cheesmanæ* belongs to the group of *S. aureum*, Fries.—it differs from the known Oriental and Australian species in its almost completely yellow tibiæ.

Simulium tahitiense, sp. n.

♀. Differs from *S. cheesmanæ* as follows:—Antennal flagellum blackish, the scape also somewhat darkened.

Thorax without ochreous tinge on shoulders. Legs mainly dark brown; hind tibiæ obscurely paler at the extreme base and also in the middle; anterior tarsi entirely black; first hind tarsal segment with apical third dark; pubescence on femora dark. Basal projection of claws larger, reaching beyond middle of claw. Wing-length about 2 mm.

The shape of the genital rod is somewhat as figured by Dyar and Shannon (Proc. U.S. Nat. Mus. lxix. 1927, pl. iv.) for *S. pecuarum*, Riley.

Society Is.: Tahiti, Tautira, 9. viii. 25; 10 ♀ taken in company with *S. buissoni*.

This species, like the last, belongs to the *S. aureum* group, and is nearly related to several others, such as *S. aureohirtum*, Brun., but I am not able to identify it with any previously known form.

Ceratopogonidæ.

Atrichopogon cavernarum, Edw.

Society Is.: Tahiti, Papeete, 13 & 24. iii. 25; large swarms among bracken 2 miles inland, 1500 ft.

First described from Selangor, this species has since been found in Assam and Fiji. It may perhaps be the same as *A. jacobsoni* (de Meij.) (Java).

Forcipomyia sp.

Society Is.: Tahiti, Papenoo, on coast-hills, 1000 ft.

Chironomidæ.

Chironomus sp.

Society Is.: Tahiti, Lake Vaihiria, 18. vii. 25, in grass. Rapa I.

All the specimens appear to belong to the same species, which is a *Chironomus* in Kieffer's most restricted sense, close to *Ch. intertinctus*, Skuse, of Australia.

Orthocladius brachydicranus, sp. n.

♂. *Head* dark above, pale at the sides and beneath. Palpi and antennæ pale. Last antennal segment hardly more than half as long as the remaining segments together, finely pubescent and slightly thickened on its outer half; plumes not very dense. *Thorax* with yellow ground-colour; scutal stripes narrowly separated, the middle one continued back to the scutellum. *Abdomen* dark. Hypopygium with the lobe of the side-piece very large, extending the whole length and slightly produced backwards; claspers slender, straight;

no distinct anal point. *Legs* pale; no tarsal beard; empodia distinct. Hind tibiæ with one rather long spur and one rather short one. *Wings* whitish, slightly brown-tinged by transmitted light, no microtrichia. Costa only slightly produced beyond R_{4+5} and ending far before the wing-tip. Cubital fork very short, its base distant from *r–m* more than the length of Cu_2; Cu_2 straight; a fold near end of *An* parallel with Cu_2. Squama quite bare. Halteres pale.

Wing-length 1·1 mm.

SOCIETY IS.: Tahiti, Papenoo, swarming in the shade on coast-hills, 1000 ft.

This rather distinct little species is evidently nearly related to the British *O. brevifurcatus*, Edw. (Proc. Zool. Soc. 1926, p. 781), which has an almost identical wing, differing in the hypopygium and the entirely black thorax. The bare squama is very unusual in *Orthocladius*, and it would perhaps be better to refer both species to *Camptocladius*, most species of which have the squama bare. This feature has not hitherto been used for taxonomic purposes, but I find it very useful for dividing *Chironomus* and *Tanytarsus*, and it is possible that in the *Orthocladius* group also it may be of generic importance.

BIBLIOGRAPHICAL NOTICES.

Handbook of the Echinoderms of the British Isles. By TH. MORTENSEN. Humphrey Milford, Oxford University Press, 1927. Price 38*s*. net.

THIS admirable work is an outgrowth of Dr. Mortensen's book on Echinoderms in the series 'Danmarks Fauna,' but is much more extensive. It includes not only the species found on the shores of Great Britain, but comprises, in fact, the whole of the Echinoderm fauna known from the north-east Atlantic. In attempting to delimit a suitable area for treatment the author was led to the conclusion that the whole of the north-east Atlantic deep-sea, from the Azores and Cape Verde Islands on the south to Iceland in the north, forms a single zoo-geographical area, and that all the species known from any place within that area may be expected to be distributed all over it, and thus to occur off the British coasts in suitable depths. Thus he has included all those deep-sea forms which may reasonably be expected to occur within the British area, though not yet actually known from there. This wise policy will add greatly to the future value of the book as an indispensable text for working zoologists and amateurs.

The phylum and each of the five classes is introduced by a general account. Numerous analytical keys lead the reader through the larger groups to the species, which are briefly described, with the addition of distributional and biological notes. Numerous line and half-tone figures (269, to be exact) add greatly to the usefulness of the work. Especially to be commended is the attention given to larval forms, which are elucidated by keys and drawings.

Dr. Mortensen, a distinguished specialist, has, in fact, provided considerably more than is usually expected of a handbook. It is not only a manual, but partakes of the nature of an original contribution, in that it bears the stamp of ripe experience and the judgment which come of many arduous campaigns in the field of Echinoderm comparative morphology and taxonomy. The author has succeeded in maintaining a safe attitude in matters concerning which considerable difference of opinion exists and which naturally do not concern a work of this sort. The treatment of groups is modern: most professional zoologists will welcome that of the Crinoids, based upon A. H. Clark's views. So also, to the reviewer, the division of the Holothurioidea into five orders seems a happier analysis than Ludwig's austere system. But the book is uniformly well done.

This work and Dr. R. Kœhler's two volumes on 'Les Échinodermes des Mers d'Europe' should stimulate interest in a group of very ancient, very curious, and, for the most part, very beautiful creatures. W. K. Fisher.

The Fauna of British India.—Hirudinea. By W. A. Harding. M.A., F.L.S., and Prof. J. Percy Moore. With an Historical Preface by Sir A. E. Shipley, G.B.E., F.R.S. Pp. xxxviii+302. With 9 Plates (4 Coloured) and Folding Map. London: Taylor & Francis, 1927. Price 25*s.*

The latest volume of the 'Fauna of British India,' on the Leeches, by W. A. Harding and Prof. J. P. Moore, is, perhaps, along with the late Dr. Annandale's volume on Hydroids, Sponges, and Polyzoa, the most interesting of the series to the general zoologist. The Indian leeches comprise only twenty-one genera and forty-six species; so that, with three hundred pages at their disposal, the authors have been able to make their work very much more than a list of generic and specific diagnoses and distributions.

The book opens with an "Historical Preface" of nearly thirty pages by the general editor, in which the history of the use of leeches in medicine is traced, beginning with the Egyptian, Chinese, and Assyrian records, through the Hindu and Pali literature and the Greek and Latin writers, to Avicenna and onwards to modern times. It is a fascinating chapter of medical history, written with Sir Arthur Shipley's customary grace. If Sir Arthur would care for a Persian quotation to add to his already diversified collection, may I venture to offer him the following, translated from Hamdullah Mustaufi's 'Nuzhat-ul-Qulub,' written in A.D. 1339–1340?—"'Alaq, leeches—black animals, or red with black spots, elongated, in size the length of the finger; the Qazwinis call them *malmal*, and one kind which is round they call *zalu*, and the Persians *divcha*. If a leech be placed on a painful place so that it sucks out the bad blood, it drops off when it becomes full; salt sprinkled on it causes it to vomit what it has sucked, and then it may be put back to suck, till it has extracted all the bad blood. If a leech enters the throat in the act of drinking water, and the smoke from foxes' dung be made to reach it, it will fall out. And if it be placed in a glass till it dies, then dried and rubbed up, and applied to a place where hair grows, no more hair will grow there."

Prof. Moore contributes a general introduction to the volume, on the segmentation of the Hirudinea, in which he explains how the enumeration is made; all leeches have the same number of segments—thirty-four,—and there is no increase during life.

The section on the Rhynchobdellæ, by Mr. Harding, is prefaced by an excellent account of the organs of systematic importance; though it is invidious to pick out one part rather than another, the description of the sinus or lacunar system, illustrated by useful diagrams, seems to call for special mention. The author recognizes, of course, that in the other branch of the Hirudinea—the Arhynchobdellæ (though not in the Rhynchobdellæ, with which he is here chiefly concerned)—"the true vascular system has disappeared, and the lacuna system, containing red-coloured lymph, alone remains in a modified form." In parenthesis, one may ask how long this primary fact in the anatomy of the jawed leeches is going to take to gain recognition by the writers of textbooks. It was demonstrated by Oka in 1902; yet most of the textbooks in current use still continue to represent the lateral vascular trunks of the medicinal leech as "true blood-vessels," and as something different from the dorsal, ventral, and other "sinuses."

All this introductory chapter is well worth the perusal of the general zoologist; it is only to be regretted that the author feels obliged to confine himself to the systems of systematic importance, and is thus prevented from giving an account of the nephridia of leeches. The strictly systematic part is, of course, of smaller general interest; but the excellent diagrams of the internal anatomy of most of the species in this part deserve a special notice. The author's conception of subgenera is not the usual one at present, but it has much in its favour, and may become more general in future:—a group of species with distinctive characters in common, or even a single species, may be separated as a subgenus, leaving the bulk of the species of the genus without a subgeneric title; in other words, it is not necessary to split up the whole of a genus into subgenera—a few groups, or even one group only, may be separated off. In the present case a single species of *Pontobdella* is so separated as a subgenus *Pontobdellina*.

Prof. Moore follows with the section on the Arhynchobdellæ. After a short account of the several systems, the coloration, and the geographical distribution of the group, he gives an interesting sketch of the relation of leeches to human interests:—(i.) as food for other animals—fishes, duck, snipe, etc.; (ii.) as enemies that attack other animals of concern to man—fishes, horses, buffaloes (it is very characteristic of *Dinobdella ferox* that it enters the nares of cattle as they drink); (iii.) as pests that annoy or injure man—as, for example, the land-leeches in the humid valleys and jungles of the Himalayas and Ceylon, where stories are told of travellers being killed outright by loss of blood; (iv.) as transmitters of human or animal diseases; and (v.) as surgical agents. The systematic part is again on a high level, and is very much more than a mere summary of generic and specific characters—see, for example, the general account of land-leeches under Hæmadipsinæ.

It is a pity that in a systematic work such as this Prof. Moore does not recognize the international rules of nomenclature; we should then have been spared the unpleasantness of having to face such barbarisms as *Erpobdella* and Erpobdellidæ, Hirudidæ, and Hirudinæ (for a subfamily): the latter two monstrosities have not even, apparently, so much right to exist as is given by priority. Misprints seem to be few: "Pinto, 1823," on p. 154, should be "Pinto, 1923," and "Matthal" on p. 238 and in the Bibliography should be "Matthai."

The coloured plates are beautifully done, and the large map of India will give useful help in identifying the localities mentioned in the text. The whole volume is deserving of warm praise.

J. Stephenson.

A Bird Book for the Pocket. By Edmund Sanders. Published by the Oxford University Press, London; Humfrey Milford, 1927. Pp. 240. Plates of all British Birds and of some Eggs. Price 7*s*. 6*d*. net.

Whilst this little volume was on our table awaiting review a friend came in, picked it up, opened its pages, and at once made the following remarks:—"Why, this is what I have been looking for for years—something small enough to take about, scientific enough for my own use, and simple enough to enable my children to identify the birds they see."

Admitting this to be correct, as we do, there is not really much to add. The object of the author in writing yet another volume on British birds was to produce a book with the virtues attributed to it by the speaker above referred to. In this he has succeeded. The letterpress is surely an excellent example of compressed, yet intelligible, information. The plates serve their purpose sufficiently—*i. e.*, they will enable any man or child to identify birds. In a small handbook of this character one does not expect, nor does one get, high art or absolute correctness of detail, whilst among the many plates some are better than others, and the artist appears to have had his *reds* considerably intensified and brightened in reproduction. One or two plates are rather quaint—for instance, the starling with an abridged tail, the kingfisher standing upright on long legs, and so on. The starling, however, is still a starling, and nothing else, and the kingfisher can be mistaken for no other British bird.

We congratulate the author on his work, and recommend it with equal confidence both to the scientist and to the child; and, finally, we read with pleasure these words in the author's Preface:—"For the Latin names I feel that the value of standardization outweighs habit and taste," and he therefore accepts the nomenclature as decided by the Committee of the B. O. U.

The Platypus, its Discovery, Zoological Position, Form and Characteristics, Habits, Life-history, etc. By HARRY BURRELL, C.M.Z.S. With 35 Plates. Sydney: Angus & Robertson, Ltd., 1927. (London: The Australian Book Company, 16 Farringdon Avenue, E.C. 4.) Price 25*s.*

MR. BURRELL's interesting book is to be welcomed as a solid contribution to zoological science. As the result of some twenty years' experience in the field, the author has acquired an unrivalled knowledge of the Platypus in the flesh, and of its life-history, habits, and mental processes. An admirable account of his researches, illustrated by many excellent photographs, forms the chief and most durable feature of the book. It contains also a useful review of much of the literature relating to the Platypus, and a discussion of the various controversies which have arisen from time to time in connection with that remarkable mammal. But, in spite of the enormous amount of work done by Mr. Burrell and others, much remains to be discovered concerning the life-history of the Platypus, and an attentive perusal of this book will suggest many lines of inquiry worthy of investigation in future.

We are accustomed to regard the Platypus as being quite highly specialized for aquatic habits; but, according to Mr. Burrell, it spends less than two hours a day in the water. In this it presents a curious parallel to certain bats. All bats are, of course, completely specialized for flight, yet many species spend but a very small fraction of their lives upon the wing. In the Platypus the aquatic modification is less complete than one commonly supposes—for instance, it is surprising to hear that a Platypus in the water is a bedraggled creature resembling a tangled mass of water-weed.

The nesting-burrows, dug and inhabited by the brooding female alone, are fully described and illustrated. The remarkable habit of plugging the burrow at intervals, both when the female leaves and when she enters her nest, and ability to run backwards as well as forwards, are things shared with the genus *Spalax.*

One or two ambiguities in the text have escaped Mr. Burrell's eye. It is disconcerting to read on p. 140 that "the upper waters of the Lachlan, Murrumbidgee, and Murray still hold a goodly store" of Platypuses, and on p. 142 that "it is remarkable that it has not been recorded from" these rivers. M. A. C. H.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[NINTH SERIES.]

No. 117. SEPTEMBER 1927.

XXXII.—*Notes on the Cephalopoda.*—III. *On the Anatomy and Classification of the North Atlantic Species of* Bathypolypus *and* Benthoctopus. By G. C. Robson, M.A.

(Published by permission of the Trustees of the British Museum.)

A.—Classification.

In 1921 Grimpe proposed the generic names *Bathypolypus* and *Benthoctopus* for certain deep-water Octopods from the North Atlantic, and subsequently I amplified his proposal (1924, pp. 657 etc.) by defining these genera. The characters upon which I based the generic distinction were those of the hectocotylus, the radula, and the surface-sculpture. I feel confident that Dr. Grimpe's proposal and my subsequent amplification of the latter are justified, in that the species placed in these genera (1) are markedly different in certain important respects from the littoral Octopods of the type of *O. vulgaris* and (2) diverge into two well-marked groups. Nevertheless, the generic position of all the species involved and their mutual affinities are by no means clear, and it seems desirable to summarize the available data. The systematic position of certain of the species involved is rendered ambiguous by the fact that one of the most characteristic features—the hectocotylus—is found in one sex only.

Moreover, I am unable to speak with certainty concerning Verrill's species *lentus* and *obesus*, which are not very fully described. As long as the characters of the radula, reproductive organs, proportions of the web, etc., remain undescribed in certain species of this group, we must remain uncertain as to the generic status of the forms in question. When several species have many characters in common, the recognition of distinct taxonomic units usually depends on the examination of many characters, and on whether there is a marked tendency for certain characters to be correlated. At present we have ample data relating to five only out of the eight species involved. The present arrangement is therefore provisional, but through the introduction of fresh material and new characters it is hoped that it will contribute to a clearer conception of the genera discussed. I have used in the following diagnoses certain characters of the female reproductive system and the dimensions of the median septum of the mantle-cavity. (For an exact indication of these characters and the methods of measurements see sections B and C.)

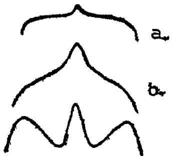
The numerical data here summarized were obtained from the original measurements, supplemented by others made on specimens in the British Museum.

BATHYPOLYPUS, Grimpe.

I redefine the genus as follows:—

Deep-water Octopods with the ligula at least one-quarter of the length of the hectocotylized arm. The radula has a unicuspidate median tooth. The skin is usually covered with warts and may be gelatinous. The arms are relatively short (under 73 per cent. of the total length), and the web usually occupies one-third or more of the maximum

Fig. 1.



Diagrammatic drawings of the extremity of the ligula copulatoria in *Bathypolypus*.

a., *Bathypolypus arcticus* (after Verrill and four specimens in Brit. Mus.); *b.*, *Bathypolypus lentus* (after Verrill); *c.*, *Bathypolypus obesus* (after Verrill).

length of the arms. The oviducal gland is large. There is no ink-sac.

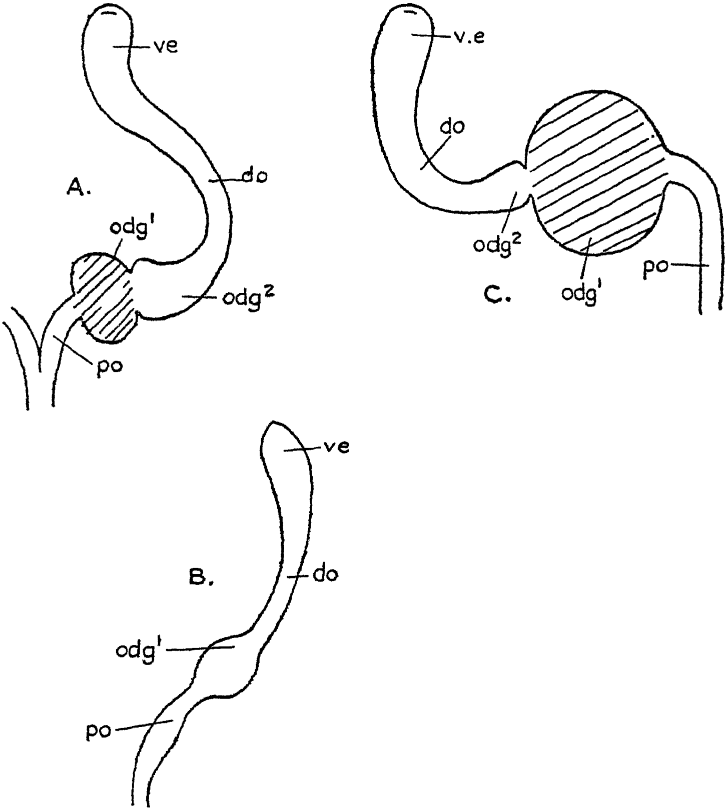
Type: *B. arcticus* (Prosch).

1. *Bathypolypus arcticus* (Prosch).

Octopus bairdii, Verrill, 1873.

The mantle is usually wide (96 per cent. of mantle-length), and the head is broad (90 per cent. of mantle-length). The arms are about 71 per cent. of the total length, and the web occupies about one-third of the length of the longest arm

Fig. 2.



Bathypolypus arcticus (A), *Benthoctopus piscatorum* (B), *Benthoctopus sasakii* (C). Female gonaduct.
(For lettering, see fig. 7.)

(average 33 per cent. in seven specimens). The arms usually have the formula 1 . 2 . 3 . 4. The maximum diameter of the suckers is 5 per cent. of the mantle-length. The mantle-aperture is half-closed (type B [Robson, 1926] in four specimens, B–C in three specimens). The septum is 17 per cent. of the mantle-length. *Reproductive organs*: (1) Male. The ligula is 24 per cent. of the total arm-length. The calamus is small and adjacent to the last sucker. There are 9–13 transverse laminæ and the tip of the ligula is shaped as in fig. 1 *a*. The spermatophores are large (Verrill) and apparently multiple (Prosch, fig. 1). (2) Female. The following are the proportions of (*a*) the distal, (*b*) the proximal, portion of the oviduct (see fig. 2), and (*c*) the oviducal gland (their length being expressed as a percentage of the mantle-length (5 specimens, British Museum):—(*a*) 26 per cent., (*b*) 8 per cent., and (*c*) 13 per cent.

2. *Bathypolypus færoensis* (Russell).

The mantle is narrower than in *arcticus* (average 84 per cent. in four specimens). The head is very narrow (59 per cent. of the mantle-length). The arm-formula is 1 . 2 . 3 . 4, and the arms are about 71 per cent. of the total length. The mantle-aperture is of type B–C. The diameter of the largest sucker is 9 per cent. of the mantle-length. The web is very deep, 44 per cent. of the arm-length. The septum is 21 per cent. of the mantle-length. The radula has a unicuspidate median tooth. *Reproductive organs*: (1) Male. The length of the ligula is 12 per cent. of the hectocotylized arm. The calamus is small and remote from the last sucker, as in *B. ergasticus*. The spermatophores are small and multiple (Russell, 1922, p. 6). (2) Female. Proportions of (1) distal oviduct, 33 per cent.; (2) of proximal oviduct, 7 per cent.; (3) oviducal gland, 16 per cent.

3. *Bathypolypus sponsalis* (P. & H. Fischer).

Octopus sponsalis, Joubin & Fischer, 1906.
Not=*Benthoctopus ergasticus* (P. & H. Fischer, 1892), *fide* Grimpe, 1922 (queries).

The mantle and head are both wide, the width of each calculated from the original figure (Joubin and Fischer, *l. c.* pl. xxii.) being about 100 per cent. of the mantle-length. The arms are 67 per cent. of the total length, and the web is 25 per cent. of the longest arm. The mantle-aperture is half-closed (B). The diameter of the suckers is 4·5 per cent. of the total mantle-length. *Reproductive organs*: Male.

The ligula is about 16 per cent. (from figure) of the hectocotylized arm, the calamus is small and far removed from the last sucker. The sides of the ligula are folded inwards.

Little more of diagnostic importance can be cited concerning this species. The shortness of the arms suggests affinity with the *arcticus* group, the small web is more characteristic of *Benthoctopus*. I attach less importance to the broad head and mantle, but these are traits found together in *B. arcticus*. The *hectocotylus* is larger than that of *ergasticus, sasakii,* and *piscatorum*, and must be regarded as intermediate between the two genera in size and form. I venture, therefore, to dissent from Dr. Grimpe and to place this species in *Bathypolypus*, with the admission that we are not yet informed as to the rest of the structure.

4. *Bathypolypus lentus* (Verrill).

The mantle and head are rather narrow (74 and 58 per cent. respectively of the mantle-length). The third arm is the longest and is 61 per cent. of the total length. The web is deep, and, to judge from Verrill's figure (pl. xxxv.), at its deepest it is about one-third the length of the arms. *Reproductive organs* : (1) Male. The ligula is enormous and more than one-third the length of the hectocotylized arm. There are nine transverse lamellæ. The calamus is adjacent to the last sucker, and the extremity of the ligula bears a marked point (fig. 1 *b*). Surface of the body etc. weakly papillate. Simple ocular cirrhi.

See under 5.

5. *Bathypolypus obesus* (Verrill).

The mantle and head are narrow (60 and 49 per cent., respectively, of the mantle-length). The arm-formula is 1.2.3.4(?). The longest arm is 67 per cent. of the mantle-length. The diameter of the largest sucker is just over 4 per cent. of the total mantle-length. The web is rather shallow (as calculated from Verrill's figures, *l. c.*, pp. 379–380), viz., about 27 per cent. of the longest arms. The surface is smooth, and there are (probably) no ocular cirrhi. *Reproductive organs* : Male. The ligula is enormous, being over one-third the size of the hectocotylized arm. It bears ten lamellæ which converge backwards, and exhibits a mid-rib. The apex is trifid (fig. *l. c.*). This form and *B. lentus* undoubtedly resemble *arcticus* in the form of the ligula, and, as they are both short-armed, I keep them in *Bathypolypus*. They are otherwise imperfectly known and their affinities are obscure.

BENTHOCTOPUS, Grimpe.

Deep-water Octopods with simple and small ligula (12–13 per cent. of total arm-length) of hectocotylus. The median teeth of the radula are multicuspid. The skin is usually smooth and may be gelatinous. The arms are relatively long—viz., 74–84 per cent. of the total length. The web is rather shallow. The oviducal gland tends to be small. There is no ink-sac.

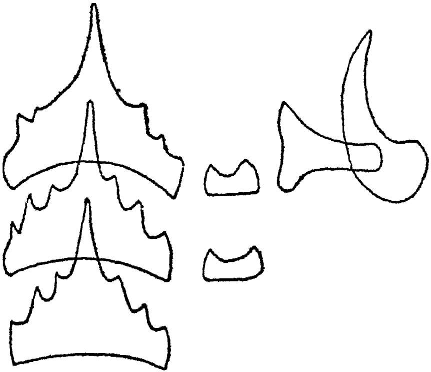
Type: *Benthoctopus piscatorum* (Verrill).

1. *Benthoctopus piscatorum* (Verrill).

Octopus normani, Massy, 1907.
Not *Octopus piscatorum*, Verrill, of Hoyle, 1886 (v. No. 3, below).

The mantle is rather narrow (75 per cent. of the mantle-length), and the head is broad (84 per cent). The arm-formula is 2.1.4.3 (?). The longest arm is 80 per cent. of the total length, and the web is 25 per cent. of the longest arm. The diameter of the suckers is 8 per cent. of the mantle-length. The pallial aperture is rather wide (B–C). The septum is usually 14 per cent. of the mantle-length. *Reproductive organs*: (1) Male. The ligula is very small (3–6 per cent. of the arm) and simple. (2) Female (fig. 2). The distal and proximal parts of the oviduct are subequal in length, measuring 19 per cent. and 16 per cent., respectively, of the mantle-length. The oviducal gland in the single specimen to which I have access is large, 17 per cent. of the mantle-length. The surface is quite smooth. The radula

Fig. 3.



Benthoctopus piscatorum. Radula, × 67.

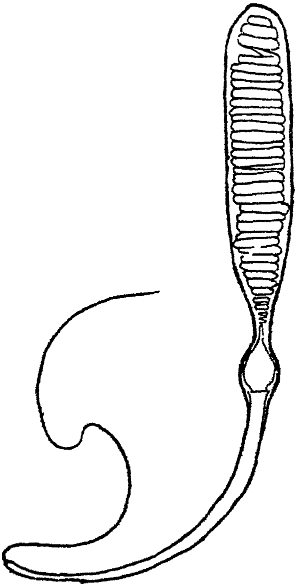
(fig. 3) is remarkable for the almost bicuspid condition of the admedians and the reduced second laterals. The radula of typical *piscatorum* is unknown. The present description is founded on a specimen from the Færoe Channel referable in all likelihood to this species.

2. *Benthoctopus ergasticus* (P. & H. Fischer).

Octopus profundicola, Massy, 1907.

The mantle is rather wide (average of six specimens (84 per cent.); the head is rather narrow (68 per cent. in eight specimens). The arm-formula is 1.2.3.4, and the longest arm is about 84 per cent. of the total length. The diameter of the largest suckers is 5 per. cent. of the mantle-length. The pallial aperture is half-closed (B). The web is shallow (27 per cent. of the longest arm). The septum is usually 17 per cent. of the mantle-length. *Reproductive organs*: (1) Male. The ligula occupies 5–12 per cent. of the length of the hectocotylized arm; it is complex and of the type seen in *Bathypolypus*. There are 8–11 laminæ and a well-developed calamus. The spermatophore is single and

Fig. 4.



Benthoctopus ergasticus. Spermatophore, ⅔ nat. size.

Fig. 5.

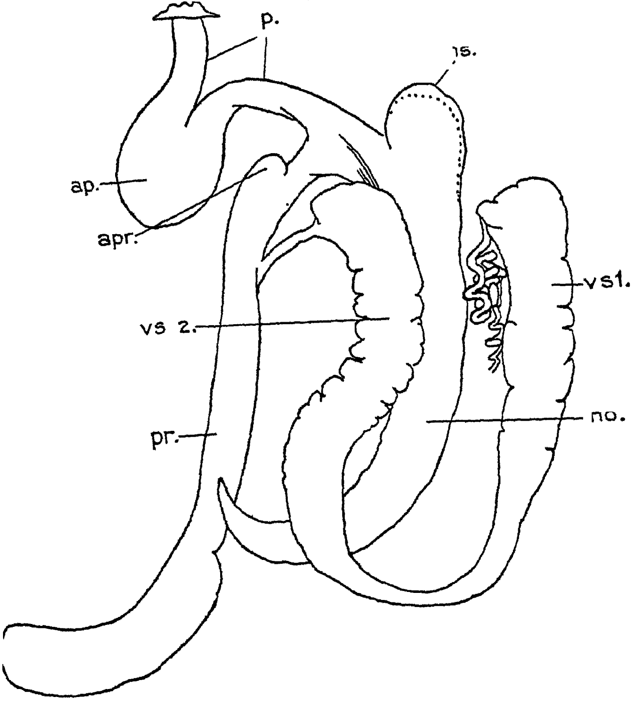
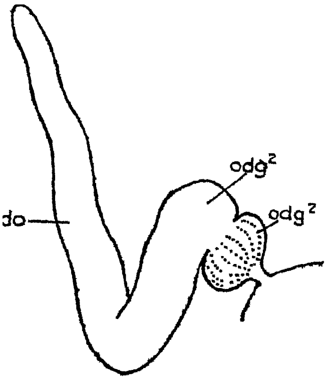


Fig. 6.



Benthoctopus ergasticus.

Fig. 5.—Male reproductive organs. *ap.*, appendix penis; *apr.*, appendix of the prostate; *no.*, Needham's organ; *pr.*, prostate; *ns.*, head of spermatophore: *vs* 1 and *vs* 2, vesiculæ seminales; *p.*, penis.

of enormous size. (2) Female. The distal oviduct is very long, 80–96 per cent. of the total mantle-length. The posterior oviduct is absent, the oviducal gland opening almost directly into the ovarian capsule. The former is small, being 8 per cent. of the mantle in length. The surface of the mantle and web is smooth, though warty projections are usually found around the eyes, and Massy (*l. c.* p. 7) records them on the dorsum.

3. *Benthoctopus sasakii*, sp. n.

Octopus piscatorum, Hoyle, 1886 [not *O. piscatorum*, Verrill].

Two specimens (♂ ♀) from 60° 5′ N., 6° 21′ W. [Færoe Channel].

The mantle is very broad, its breadth equalling its length in both sexes. The head is moderately wide, 75–76 per cent. of the mantle-length. The arm-formula is 2 . 3 . 4 . 1, and the longest arm is 72–75 per cent. of the total length. The web is moderate (32–33 per cent. of the arms). The mantle-aperture is rather wide (B–C). The diameter of the largest suckers is 9 per cent. of the mantle-length. The septum is short in both examples, being 11–12 per cent. of the mantle-length. *Reproductive organs* : (1) Male. The ligula occupies about 12 per cent. of the length of the hectocotylized arm. It is less specialized than that of *O. ergasticus*, but more complex than that of *O. piscatorum* (Verrill, 1885, pl. xlii.). It resembles that of *B. sponsalis* (Joubin and Fischer, *l. c.* p. 324), but it differs in the fact that (1) the last sucker is adjacent to the calamus, and (2) that the laminæ copulatoriæ are scarcely defined. The spermatophores are slender and multiple. (2) Female. The distal and proximal parts of the oviduct are subequal (38 and 30 per cent. respectively of the mantle-length). The oviducal gland is small (11 per cent. of the latter). The surface is entirely smooth. The radula differs from that of *B. ergasticus* in that the adlateral has a very low cusp and broad base instead of a high cusp and a narrow base. From *B. piscatorum* (q. v.) it differs in the possession of more normal second laterals and in the shape of the adlaterals. Type in British Museum (Natural History); 89.4.24.33–34.

This species differs from its allies in the shortness of the arms, the saccular shape of the mantle, the structure of the hectocotylus and female genital organs, and the radula.

The species is named after my friend Professor Madoka Sasaki, to whom I am indebted for much valuable information.

B.—THE REPRODUCTIVE ORGANS OF *BATHYPOLYPUS* AND *BENTHOCTOPUS*.

A. *The Male System.*

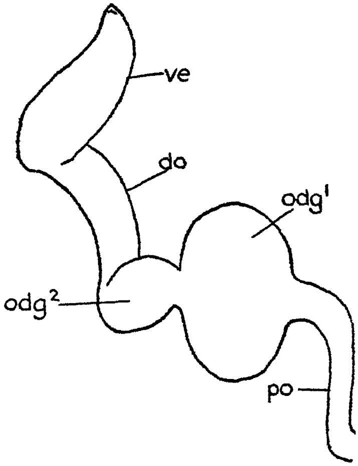
I have examined the male reproductive organs of *Bathypolypus arcticus* and *Benthoctopus ergasticus* and *sasakii*. Those of *Bathypolypus grimpei* have already been figured by me (1924, p. 666).

In these forms the male organs do not differ in outward appearance very markedly from those of *O. vulgaris* and other shallow-water forms. In *B. arcticus* (Prosch, 1849, fig.) the appendix penis is very large, and there appears to be no appendix of the prostate. In *B. ergasticus* the appendix penis is likewise very large. There is a small appendix of the prostate. The sections of the vesicula seminalis are very well developed, but there appear to be only two of these instead of three. The outstanding feature of the male reproductive organs of these genera is the enormous size attained by the spermatophores. In *B. arcticus* they are described by Verrill (1880, p. 370) as attaining a maximum of 75 mm., the male of this species having a recorded mantle-length of 50 mm. In *B. grimpei* (Robson, 1924, p. 667) they measure about 32 mm. in a specimen 57 mm. in mantle-length. In *B. sasakii* they are slender and more like those of littoral forms. In the form just mentioned there are always several spermatophores to be found in Needham's organ. But in *B. arcticus* and *ergasticus* there is only a single one found. In *B. ergasticus* (fig. 4) this is enormous, measuring as much as 130 mm. in a male 78 mm. in mantle-length. They are likewise very stout and the aboral extremity is very much swollen. This extremity lies at the oral end of Needham's organ before the spermatophore leaves the latter (see fig. 5). Just below the *sperm-tube* (aboral portion) there is in *B. ergasticus* a marked constriction, after which the spermatophore expands again to contain (?) the *false tube*. This feature is absent in *B. arcticus* (Brit. Mus. and Verrill, *l. c.* pl. xxxvi.).

B. *The Female System.*

I have examined the female reproductive organs of *Bathypolypus færoensis* and *arcticus* and *Benthoctopus sasakii*, *ergasticus*, and the forms referred to above as *B. piscatorum*. This system is virtually unknown from the taxonomic point of view. It exhibits quite marked interspecific divergence and should be of considerable taxonomic service, if regularly employed. The interspecific differences are more marked and more rapidly appreciable than those seen in the muscular and glandular portions of the male system ; and I believe that they correspond to differences in the mode of insemination and in the size and form of the spermatophore, though as yet we know very little concerning the actual process of fertilization after the spermatophore is introduced into the pallial cavity of the female.

Fig. 7.



Bathypolypus færoensis. Female gonaduct.

do, *po*, distal and proximal portions of oviduct; *odg*[1], oviducal gland; *odg*[2], appendix of oviducal gland; *ve*, vagina (?).

In all deep-water species considered herein, with the possible exception of *B. sasakii*, the female genitalia (oviducts and oviducal glands) are large and coarsely built, differing in this respect from those of other Octopods (*s. s.*) in which the ducts are usually slender and the glands small.

BENTHOCTOPUS.

In *B. sasakii* (fig. 2) the distal part of the oviduct exhibits a vaginal expansion and the oviducal gland is small. In *B. ergasticus* (fig. 6) the distal portion of the oviduct is very long, stout, and devoid of a vaginal expansion. The oviducal gland is small and the first part of the oviduct is absent.

The proximal section of the distal part is swollen and foreshadows the "appendix" seen in other forms. In *B. piscatorum* (fig. 2) (Brit. Mus.) there is a well-developed vagina. The oviducal gland is enormous.

BATHYPOLYPUS.

In *B. arcticus* (fig. 2) the distal part of the oviduct is longer than the proximal. There is a vaginal expansion and the proximal end is swollen to form a sort of appendix to the oviducal gland. The latter is moderate in size. In *B. færoensis* (fig. 7) there are well-developed vaginal and appendiciform expansions. The oviducal gland is very large.

I was prepared to find some considerable individual variation in the size of the oviducal gland and therefore to discount its taxonomic value. But in such series of individual species as are available the variability is not more marked than that of other parts. The significance of the "appendix" of the oviducal gland is obscure. In *Opisthoteuthis* (Meyer, 1906) the oviducal gland is double. If this resemblance has any substantial basis, the reduplicature of the oviducal gland and the general coarse and heavy structure of the female apparatus in *Opisthoteuthis* and the deep-water Octopods here reviewed may depend on some similarity in the reproductive function in the two groups. It is important, however, to notice that, as there are no fully formed spermatophores in *Opisthoteuthis*, we cannot reasonably associate the size and configuration of the oviduct in *Opisthoteuthis* with peculiarities in the means of insemination, as we have attempted to suggest in the case of *Bathypolypus* and *Benthoctopus*.

C. *The Pallial Septum.*

The Octopodidæ, in common with *Idiosepius*, *Lepidoteuthis*, and the Sepiolidæ alone among the Decapoda (*cf.* Naef, 1923, p. 504), possess a median pallial adductor muscle, which arises from the inner surface of the mantle and is inserted on to the visceral mass along a narrow median line just below the anus. This sheet of muscle subdivides the mantle-cavity into two intercommunicating areas, the septum being incomplete towards the mantle-apex. The *raison d'être* of this muscular septum* in the Octopodidæ and

---

* The use of the word "septum" in this connection may seem to involve the assumption that the subdivision of the mantle-cavity by the pallial adductor has in itself some functional significance. Certainly

Sepiolidæ is obscure. Its absence in the actively swimming Egopsida is curious—if, indeed, it assists in the more effective contraction of the walls of the pallial cavity. I have been struck during a survey of the Octopoda with the amount of interspecific variability in the extent of this septum. In some forms it is very small, in others it reaches far up into the apex of the mantle-cavity. So far my observations only permit me to state that the variation is largely independent of (*a*) age and (*b*) sex. The method chosen for assessing the extent of the septum is to measure the length of the septum midway between its origin and its insertion in the visceral mass and to express that measurement as a percentage of the total mantle-length.

In the deep-water genera here reviewed the septum is shorter than in *O. vulgaris* and its allies, its length ranging from 17–11 per cent. of the total mantle-length, whereas in the shallow-water forms examined so far its range is 16–40 per cent. I hope, however, in a forthcoming publication to present more detailed and ampler data on this subject.

D. *Radulæ.*

The radula of *Bathypolypus arcticus* is figured by Verrill (*l. c.* pl. xlix.), that of *B. færoensis* by Russell (1921, fig. 4), and that of *Benthoctopus ergasticus* by Massy (1909, pl. l.). I now figure and describe those of *Benthoctopus sasakii* and *piscatorum* and refigure that of *B. ergasticus*. As already stated, the character of the median tooth, whether unicuspid or bicuspid, is an important diagnostic feature.

The material at my disposal does not allow me to assign the radulæ of the forms now described to one or another of the main types of seriation described by me (Robson, 1925). Certain features of general interest emerge, however—viz., the presence of an undoubted bicuspid adlateral in *B. piscatorum* and the further proof of the degeneration of the marginals figured by me in *B. grimpei* (Robson, 1924, p. 665) and (more remarkable still) of the second lateral.

Benthoctopus sasakii (fig. 8).—There is an obscure type of asymmetrical seriation in the rhachidians. The adlateral is long and of the *vulgaris* type. The second lateral has a strong mesocone (in none of these forms do we find an

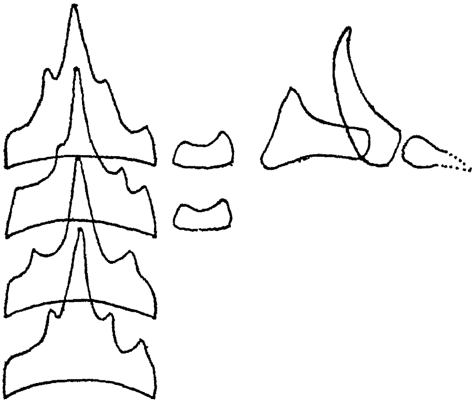
---

the trivial extent to which this subdivision is carried in the forms here reviewed warrants no such assumption. Nevertheless, in other forms the adductor supported by sheets of connective tissue attains so extensive a distribution that the subdivision of the mantle-cavity becomes very marked, though I grant it may have no functional significance.

entocone), but the base is abbreviated and weak. The marginal is rudimentary.

Benthoctopus piscatorum (fig. 3).—The rhachidian seriation is very obscure and possibly absent. The adlateral is bicuspid.

Fig. 8.

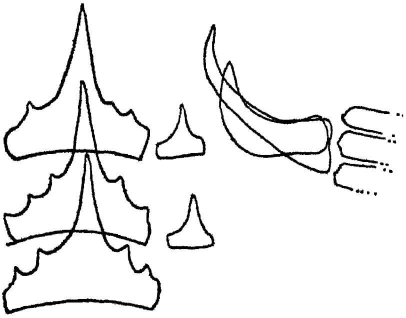


Benthoctopus sasakii, sp. n. Radula, × 67.

The second lateral has a low mesocone and the base is weak. There is no trace of marginal plates.

Benthoctopus ergasticus (fig. 9).—Massy (*l. c.*) gives a clear figure; but, although she shows a unicuspid rhachidian, all

Fig. 9.



Benthoctopus ergasticus (Fischer). Radula, × 67.

the examples from the original haul which I have examined have 1–3 lateral cusps aside. The seriation is obscure. The adlaterals and 2–3 laterals are as figured by Massy, though the latter does not show the acute erect cusp of the adlateral figured herein. The claw-like third lateral is very characteristic in shape. There are faint traces of marginal plates in one of my examples.

BIBLIOGRAPHY.

1. HOYLE, W. E. 1886. Sci. Repts. 'Challenger' Expedn., Zoology, vol. xvi.
2. JOUBIN, L., and FISCHER, P. 1906. Rés. Sci. Expéd. 'Travailleur' et 'Talisman' (Céphalopodes, p. 313).
3. MASSY, A. L. 1907. Ann. & Mag. Nat. Hist. (7) xx. p. 377.
4. ——. 1909. Dept. Agric. etc. Ireland (Fisheries; Sci. Invest.) (1907, no. 1).
5. MEYER, W. 1906. Zeitschr. Wiss. Zool. lxxxv. p. 183.
6. NAEF, A. 1923. Fauna e Flora del Golfo di Napoli, 35 Monogr. 2ª Puntª.
7. PROSCH, V. 1849. K. Dansk Vid. Selsk. (5) i. p. 53.
8. ROBSON, G. C. 1924. Proc. Zool. Soc. p. 589.
9. RUSSELL, E. S. 1922. Fisheries, Scotland, Sci. Invest. 1921, iii.
10. VERRILL, A. 1881. Trans. Conn. Ac. Sci. v. pp. 368 and foll.
11. ——. 1885. *Op. cit.* vi. p. 395.

XXXIII.—*Papers on Oriental* Carabidæ.—XX.

By H. E. ANDREWES.

IN April 1926 I published in these 'Annals' some notes on the genus *Clivina* and some of its allies. Bates's introduction of the American genus *Oxydrepanus* into the Oriental fauna was at that time provisionally accepted, but a further study of the material leads me to think that a new genus is really required, and this is described below. Two other allied genera, *Coryza* and *Psilus*, are also dealt with, two new species of the latter genus are described, and keys given to all the species. I have taken the opportunity to add descriptions of three new species of the genus *Clivina*, and at the end add a few further notes on synonymy.

TRILOPHUS, gen. nov.

Oxydrepanus, Bates, Ann. Mus. Civ. Gen. 1892, p. 283; Andrewes, Ann. & Mag. Nat. Hist. (9) xvii. 1926, p. 378.

Form small, elongate; colour red or testaceous; body winged. *Head* small, convex, with a moderately deep longitudinal impression on each side, curving outwards at extremities; eyes rather small, not prominent, with two supraorbital setæ; labrum 5-setose, slightly emarginate in front; clypeus bisetose, convex, triangular, the lateral and median parts fused, the front edge, which forms the base of the triangle, a little emarginate, lateral teeth moderately sharp, but not projecting far, the sides of the triangle meeting on middle of front, whence a short fine ridge runs longitudinally backwards, with a deep impression on each side of it; frontal plates convex, a slight longitudinal ridge running back on each side behind them; mandibles short, but very sharp; ligula bisetose, truncate, paraglossæ invisible and apparently fused with it; mentum very short, with a slight emargination and a small tooth; maxillæ straight, not very sharp, fringed rather sparsely within with spines, which reach to apex, outer lobe jointed and extending a little beyond inner one; palpi with apical joint long, inwardly dilated at base and tapering to a point at apex, in the maxillaries ♂ hollowed out on inner side; antennæ moniliform, fully pubescent from joint 4, though joints 2 and 3 are partially pubescent, 1 and 2 fairly long and about equal. *Prothorax* moderately convex, but not globose, sides bisetose, the border turning inwards before reaching hind lateral pore and ending just outside it on upper surface; a median line present, front transverse impression obsolete at middle, hind one adjoining basal border, basal foveæ wanting. *Elytra* somewhat depressed, with a deep marginal channel, border rounding shoulder, where there is a tooth, and extending to a point opposite stria 5, sinuate above shoulder and rather hooked at extremity, the hook enclosing a large umbilicate pore, another umbilicate pore on each side of base, adjoining suture; 8-striate, the striæ punctate, the eighth stria wanting and probably fused with the ninth in the marginal channel, where the series of umbilicate pores, from which here and there long setæ project, is uninterrupted. Metasternum longitudinally sulcate, its process bordered. Venter bordered at base between the metacoxæ, segments bisetose, transversely sulcate, and with the hind margin crenulate, last segment with two setæ on each side. Legs adapted for digging, profemora strongly dilated; protibiæ produced at apex into a spiniform process, with two spines along outer margin, mesotibiæ without spur; tarsi about half the width of tibiæ, joint 1 about equal to 2+3, 5 as long as 1, protarsi ♂ not dilated. Surface smooth and shining, with or without erect setæ, a microsculpture present on head only.

Genotype, *Dyschirius interpunctatus*, Putzeys.

The new genus differs in many ways from *Dyschirius*, and from *Oxydrepanus* it differs in the form of the head, the lateral border of the prothorax, and the character of the tarsal joints ; in the American genus these are extremely fine, barely a third as wide as the tibiæ, with joint 1 as long as all the other joints together.

The species and its varieties include the following, all described under the genus *Dyschirius* :—

interpunctatus, Putz. Ann. Soc. Ent. Belg. x. 1867, p. 97 (= *Oxydrepanus birmanicus*, Bates, Ann. Mus. Civ. Gen. 1892, p. 283).
hispidulus, Putz. Ann. Soc. Ent. Belg. x. 1867, p. 98.
impunctatus, Putz. Ann. Soc. Ent. Belg. xi. 1868, p. 10.
schmidti, Putz. Compt. rend. Soc. Ent. Belg. 1877, p. 41.

Key to the Species and Varieties.

1 (6). Elytra with setiferous pores on at least some of the intervals.	
2 (5). Elytra with setiferous pores on intervals 3 and 5.	
3 (4). Colour fulvous, average length 2·5 mm.	*interpunctatus*, Putz.
4 (3). Colour dark red, average length 2·85 mm.	var *schmidti*, Putz.
5 (2). Elytra with setiferous pores on all the intervals, except the sutural one	var. *hispidulus*, Putz.
6 (1). Elytra without any rows of setiferous pores on the intervals (though setæ may be present in the striæ)........	var. *impunctatus*, Putz.

Genus Coryza.

The following species have been described :—

maculata (*Clivina*), Nietn. Journ. As. Soc. Beng. 1856, v. p. 391 ; id. Ann. & Mag. Nat. Hist. (2) xix. 1857, p. 246.
nietneri, Putz. Ann. Soc. Ent. Belg. x. 1867, p. 196 (= *Clivina maculata* Putz. Mém. Liège, xviii. 1863, p. 51).
cariniceps, Putz. Ann. Soc. Ent. Belg. x. 1867, p. 196.
chlorizans (*Clivina*), Bates, Ann. Mus. Civ. Gen. 1892, p. 282.
semirubra, Andr. Ent. Month. Mag. 1926, pp. 67 & 71.

The type of *nietneri* is lost, but I have now seen the types of all the other species. Putzeys devotes three lines to each of his descriptions, and the characters given to differentiate them consist in the colour and in the form of the prothorax and elytra. The colour is dark, often black, usually with some æneous reflection, and sometimes with traces of brown or dark red on some part of the elytra. Bates did not recognize the genus and described his species as a *Clivina*.

After examining a good many specimens, I have found great individual variability, as in the genus *Clivina,* and am unable to discover adequate characters to separate the first four of the species enumerated above, which I treat as one, under the name of *maculata,* Nietn. *C. semirubra,* which inhabits a limited and chiefly mountainous area in the United Provinces, resembles *maculata* in a good many characters, but seems entitled to rank as a separate species. It differs in colour, the basal half of the elytra red, the apical half black, the head with a transverse ridge in front of the neck-constriction, the basal tubercles on the elytra very slight, the humeral tooth well developed; in *maculata* the transverse ridge on the head is wanting, the basal tubercles on the elytra are strongly developed, and the humeral tooth is rather slight.

Genus Psilus.

The described species are as follows:—

paradoxus (*Ardistomis*), Putz. Ann. Soc. Ent. Belg. xi. 1868, p. 21 (=*acutipalpis,* Putz. Compt. rend. Soc. Ent. Belg. 1877, p. 46=*Clivina trapezicollis,* Bates, Ann. Soc. Ent. Fr. 1889, p. 263).
doriæ (*Dyschirius*), Putz. Ann. Soc. Ent. Belg. 1873, p. 14.
porphyreus, Andr. Spol. Zeyl. 1923, p. 227.

The synonymy of *paradoxus* was indicated in my former paper, and I now find that *Dyschirius doriæ,* Putz., must also be included in this genus. The descriptions of two new species are added below.

Key to the Species.

1 (4). Head with a longitudinal ridge on each side of vertex, prothorax with sides fully bordered, elytra with a well-developed tooth at shoulder, interval 3 tripunctate.
2 (3). Head with lateral ridges well developed, labrum 7-setose, prothorax with hind angles dentate, border of elytra crenulate . *paradoxus,* Putz.
3 (2). Head with lateral ridges slight, labrum 3-setose, prothorax with hind angles not dentate, border of elytra smooth .... *fulvaster,* sp. n.
4 (1). Head without longitudinal ridges, prothorax not bordered beyond hind lateral pore, elytra without well-developed tooth at shoulder, interval 3 impunctate.
5 (8). Prothorax with median line not deeper behind, elytral border not evidently dentate.

6 (7).	Elytral striæ deep, shoulders slightly toothed. Length 2·3 mm.	*porphyreus*, Andr.
7 (6).	Elytral striæ shallow, shoulders without tooth. Length 2·0 mm.	*malayicus*, sp. n.
8 (5).	Prothorax with median line deeper behind, elytral border evidently dentate. Length 2·1 mm.	*doriæ*, Putz.

Psilus fulvaster, sp. n.

Length 2·8 mm.

Dark fulvous; palpi, joint 1 of antennæ, and tarsi flavous.

Head narrowed in front, facial sulci deep, parallel in front, bending sharply outwards at front eye-level and carried round behind eyes; labrum 3-setose; clypeus truncate in front, the angles rounded, the area behind oblong, somewhat flattened, clypeal suture moderately deep, slightly curved, frontal plates convex, rather long, evidently carinate behind; neck convex, with a subpunctulate constriction, deep at sides, almost interrupted at middle; eyes moderately prominent, slightly enclosed by genæ behind; antennæ reaching base of prothorax, apical joints longer than wide; surface with a faint microsculpture of isodiametric meshes. *Prothorax* convex, trapeziform, half as wide again as head, barely wider than long, strongly narrowed in front and widest at about basal fourth, sides nearly straight in front, fully bordered, hind angles rounded away, without tooth; median line rather fine, front transverse impression fairly deep, subcrenulate, not quite reaching front margin, surface smooth. *Elytra* convex, elongate-oval, though with evident shoulders, a fourth wider than prothorax and about two-thirds longer than wide, shoulders with an evident tooth, basal border reaching a point opposite stria 4, side-border smooth; striæ punctate, moderately deep, 1 only reaching apex, though the rest nearly do so; intervals convex, 3 with three pores adjoining stria 3, surface smooth. Protibiæ with the two spines moderately developed.

Borneo: Riam Kanan, Martapura (*Doherty*), 2 ex. (my coll.); Pontianak, 1 ex. (coll. T. G. Sloane).

The type is in my collection.

Psilus malayicus, sp. n.

Length 2·0 mm.

Fulvous; palpi, antennæ, and tarsi flavous.

Head narrowed in front and somewhat flat, convex behind, facial sulci deep, diverging behind, with a slight carina—and outside it an elongate depression—between hinder part and eye; labrum 5-setose, the central and two outside setæ much longer than the two intermediate ones; clypeus truncate in front, angles rounded, forming behind a rather elongate, flattened, oval area, clypeal suture transverse, not very deep, frontal plates convex; vertex and neck tumid, latter not constricted, but with a small tubercle on each side; eyes very small and flat, largely enclosed in the genæ, which project as far as and are rather longer than eyes; antennæ moniliform, reaching rather beyond base of prothorax; surface with a faint microsculpture of isodiametric meshes. *Prothorax* convex, trapeziform, a half wider than head and slightly wider than long, narrowed in front, sides gently rounded in front, border not extending beyond hind lateral pore, hind angles rounded, without tooth; median line very fine, front transverse impression fairly deep, not reaching margin, surface smooth. *Elytra* convex, oval, a fifth wider than prothorax, a little more than a half longer than wide, shoulders quite rounded away and without sign of tooth, basal border reaching a point opposite stria 4, side-border very narrow, hardly perceptibly dentate; striæ rather lightly impressed and punctate, an underlying brown area beneath each puncture, increasing its apparent size, 1 only reaching apex, the others disappearing a little before it; intervals moderately convex, 3 impunctate, surface smooth. Protibiæ with upper spine obsolete.

Penang (*G. E. Bryant*), x. 1913, 1 ex. in my collection.

Clivina lewisi, sp. n.

Length 7·0 mm.

Black: palpi, antennæ, and two hind pairs of legs more or less brown.

Head with rather prominent eyes, median part of clypeus faintly emarginate, hardly bordered, wings small and rounded, nearly as far advanced as median part, and separated from it by a slight notch; frontal plates convex, bordered, separated from clypeus by a similar notch; surface of clypeus transversely depressed in front, slightly raised behind, clypeal suture rather fine; frontal impressions deep, uneven, facial carinæ slight, the sulci within them not nearly reaching clypeal suture; neck-constriction moderately deep, crenulate, a pore on vertex, surface generally smooth; labrum 7-setose, mandibles short and rather blunt, antennæ moniliform, joint 2 a little longer than 3. *Prothorax* moderately convex, quadrate, about as long as wide, sides slightly rounded, hind angles distinctly dentate, sides of base nearly straight;

median line and front transverse impression both fairly deep, latter reaching margin at extremities, surface with a few transverse striæ. *Elytra* moderately convex, hardly wider than prothorax, but fully twice as long as wide, parallel, the shoulders square; striæ fairly deep and minutely punctate, 1 joining 2 at base, 3 free, 4 joining 5, 6, and 7 at shoulder, striole rather slight; intervals convex, 3 with four pores adjoining stria 3, 8 carinate at both ends, rounding shoulder in front and ending opposite stria 5. Prosternum with a few punctures at sides, its episterna alutaceous and transversely striate, prosternal ridge slightly sulcate. Venter strongly punctate at sides, the two apical pores close together. Profemora dilated, protibiæ sulcate, with three slender digitations and a small upper tooth, mesotibiæ with a long spur at apical third.

Nearly allied to *C. lobata*, Bon., but the front margin of clypeus is nearly straight, instead of being deeply excised, the neck-constriction entire and deep, sides of prothorax somewhat rounded, a more evident tooth at hind angle, the elytral striæ deeper, and the venter at sides much more punctate.

JAPAN: Kobe, Harada (*J. E. A. Lewis*), 3 ex.—viz., 2 ex. (including type) in my collection and 1 ex. in the British Museum.

Clivina talpa, sp. n.

Length 6·0 mm.

Black: palpi and two hind pairs of legs ferruginous, antennæ and front legs more or less brown.

This species, like that just described, belongs to the *lobata*-group. It is rather smaller than *lewisi*, and agrees with it in most of its characters, including the deep and uninterrupted neck-constriction. It differs in having the front of the clypeus more evidently emarginate and the facial carinæ very slight, barely reaching halfway from the constriction to the clypeal suture, the pore on vertex very small. The prothorax has only an inconspicuous tooth at hind angles, and the surface, like that of the head, is evidently though minutely punctulate. The elytra are similar and are deeply striate, but relatively they are rather longer and the intervals rather narrower. The tooth at each end of hind margin of profemora is very strongly developed.

BORNEO: Pengaron, Martapura, 5 ex. (my collection).

Clivina bullata, sp. n.

Length 5·0 mm.; width 1·1 mm.

Black: palpi, basal joints of antennæ, and two hind pairs of legs more or less ferruginous, front legs piceous.

Head with moderately prominent eyes, clypeus completely fused with the wings, the whole bordered, angles rounded, slightly emarginate at middle, with a transverse, oval, bordered depression behind, which is immediately succeeded by the deep clypeal suture, frontal plates rather inconspicuous, separated from clypeus by a slight notch; frontal impressions and facial sulci forming a deep, wide, uneven groove on each side, the carina terminating the frontal plates and a lateral carina forming one hardly interrupted ridge; vertex with an elongate pore at middle, on each side of which is a rounded tubercle, sides behind coarsely punctate, the punctures extending across neck, which is unconstricted, surface generally very uneven; labrum 7-setose, mandibles short, wide, and blunt, antennæ moniliform, not nearly reaching base of prothorax. *Prothorax* very convex, subcylindrical, a fifth longer than wide, sides parallel, hind angles rounded, without tooth, sides of base curved; median line and front transverse impression both fairly deep, latter reaching margin at extremities, surface with a few transverse striæ. *Elytra* convex, as wide as prothorax, and twice and a third as long as wide, sides parallel, shoulders square; striæ punctate, rather deep near base, becoming gradually shallower towards apex, 1 to 3 free at base, 4 to 7 all joining above shoulder, striole obsolete; intervals convex, 3 with four pores, practically in stria 3, 8 carinate at both extremities, rounding shoulder in front and ending opposite stria 5. Prosternal ridge not very narrow, nor sulcate; metasternal process bordered. The two apical ventral pores widely distant. Profemora dilated; protibiæ without sulcus on upper surface, the lateral spines small and dentiform, mesotibiæ without spur.

Very near *extensicollis*, Putz., but smaller and narrower, the head with the same transverse-oval depression on clypeus, but bituberculate behind, the prothorax not or hardly narrowed in front, the elytra rather more deeply striate.

TIMOR: Lion Mountain, 2000–4000 ft. (*Doherty*), 3 ex. (my collection).

NOTES ON SYNONYMY, ETC.

In January of this year I published in these 'Annals' (pp. 97–111) some notes made during a visit to the Berlin

Zoological Museum. In preparing these I came across a few points requiring further elucidation, and Mr. Christoph Bollow, at the instance of Dr. W. Horn, has been kind enough to clear them up for me. I take this opportunity of thanking both of them for their assistance:—

(1) In addition to the types of various authors mentioned in my paper as being in the Berlin Zoological Museum, the types of the following species were also found to be there:—*Glycia ornata*, Klug, *Egaploa* (*Stenolophus*) *fulvipes*, Erichs., *Anchomenus* (*Carabus*) *foveolatus*, Illig., *Tachys* (*Carabus*) *quadristriatus*, Illig., and *Chlænius celebensis*, L. W. Schauf. (2) Types of the following species, some of which at least seemed likely to be at Berlin, could not be found, and I am now treating them as lost:—*Anchomenus* (*Agonum*) *cupratus*, Sturm, *Tachys ornatus*, Apetz, and *Coptodera subapicalis*, Putz. (3) A comparison of an example of *Æphnidius simplex*, Schm. Goeb. (1846), with the type of *A.* (*Masoreus*) *opaculus*, Zimm. (1832), confirms my supposition of the identity of the two species.

During the past year or two I have come across the following instances of synonymy:—

1. *Stenolophus castaneipennis*, Bates, Trans. Ent. Soc. Lond. 1873, p. 269 = *S. iridicolor*, Redt. Reis. Novar. Zool. ii. 1867, Col. p. 16.

Redtenbacher's examples had dark elytra; in the specimens originally described by Bates the elytra were of a chestnut-colour, but other examples subsequently taken by Mr. George Lewis were of the dark form. Bates's name should be retained for the castaneous variety.

2. *Vulcanophilus*, Heller, Abh. Mus. Dresd. vi. 3, 1896, p. 2 = *Colpodes*, Macleay, Ann. Jav. 1825, p. 17.

Two species were described—*V. calathoides* and *V. spinifer*. I have a co-type of the former in my collection, and Dr. F. van Emden of the Dresden Museum has kindly sent me another one for examination. Being unable to discover any characters differentiating *Vulcanophilus* from *Colpodes*, I am adding the two species to the latter genus.

3. *Periyona annamita*, Fvl. Rev. d'Ent. 1907, p. 104 = *P. discipennis*, Bates, Trans. Ent. Soc. Lond. 1883, p. 265.

4. *Perigona tachyoides*, Bates, Trans. Ent. Soc. Lond. 1883, p. 265 = *P. nigriceps*, Dej. Spec. Gen. v. 1831, p. 44.

5. *Orthogonius macleayi*, Andr. Trans. Ent. Soc. Lond. 1919, p. 166 = *O. intermedius*, Chaud. Ann. Soc. Ent. Belg. xiv. 1871, p. 102.

6. *Taromorpha alternata*, Blackb. Proc. Linn. Soc. N.S. Wales, 1894, p. 85 = *Celænephes parallelus*, Schm. Goeb. Faun. Col. Birm. 1846, p. 78.

XXXIV.—*A Collection of Echinoderms from China.*

By George A. Smith, British Museum (Natural History).

Professor C. Ping of the University of Amoy has recently presented to the British Museum (Natural History) a small collection of Echinoderms from the coast of China. It includes two specimens of a species of *Asterina*, which is here described as new, and the known range of two other species is extended. I am indebted to Dr. Austin H. Clark, of the United States National Museum, Washington, D.C., for very kindly identifying the Crinoid.

The following is a list of the specimens received:—

Asteroidea.

Asterina limboonkengi, sp. n. Amoy.
Anthenea pentagonula (Lamarck). Amoy.
Astropecten scoparius, Valenciennes. Amoy.

Ophiuroidea.

Ophiocnemis marmorata (Lamarck). Fukien.
Ophiothrix marenzelleri, Koehler. Fukien.
Ophiactis affinis, Duncan. Fukien.

Echinoidea.

Arachnoides placenta (Linnæus). Foochow.
Peronella lesueuri (L. Agassiz). Amoy.
Temnopleurus toreumaticus (Leske). Amoy and Fukien.

Crinoidea.

Oligometra chinensis, A. H. Clark. Fukien.

*Asterina limboonkengi**, sp. n.

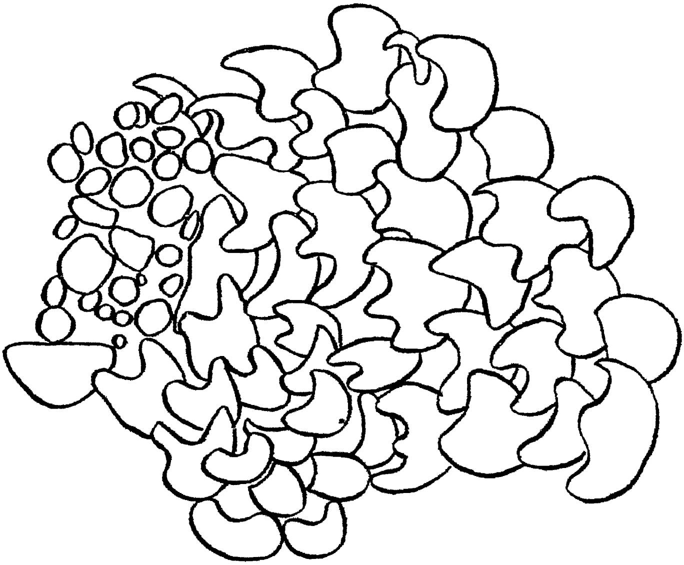
Locality. Amoy, China.

Description. Two specimens in spirit, colour light brown. R. 18 mm., r. 7 mm.; R. 16 mm., r. 7 mm. Height of disc 5 mm. Rays 5.

General form stellate, with quickly tapering rays, interradial arcs deeply notched and distinctly triangular; actinally flat.

The abactinal surface is very evenly covered with imbricating funnel-shaped plates, the concave margin being toward the centre of the disc. On the rays these plates are arranged in longitudinal rows, eight on either side of the median line, at the base of the arm decreasing to six distally. The centro-dorsal area of the disc is distinct, circular in shape, slightly depressed, and consists of about forty

Fig. 1.



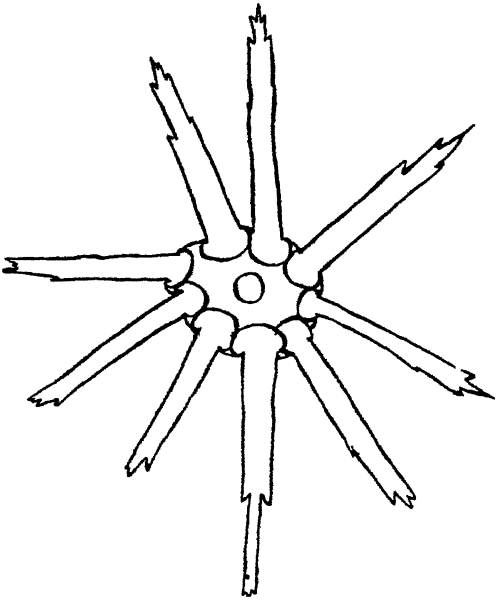
Abactinal plates on the median area of an arm and central-dorsal area of the disc.

---

* At the request of Prof. C. Ping, the donor of the collection, I have named this new species after Dr. Limboonkeng, President of the University of Amoy.

irregularly shaped small plates; it measures 4 mm. Some of the plates surrounding this area are double-funnel-shaped and enlarged. The terminal plate is spherical, about the same size as the madreporite, and finely granulated.

Fig. 2.

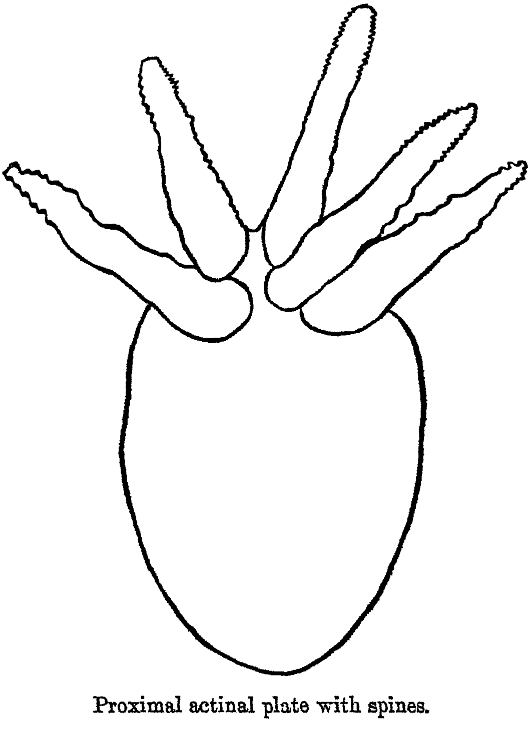


An abactinal plate with spines.

There are five to ten equal spines, arranged in a circular group, upon the abactinal plates, having usually two thorns or serrations on either side, as well as two or three at the tip; their bases are slightly swollen. These spines well protect the papulæ, and form a very regular star-like decoration over the whole of the abactinal surface. The papular area reaches almost to the tip of the ray, and on either side of the median line it extends to the fifth row of plates at the base of the arm and to the third distally. The infero-marginal plates are distinct, semicircular, and form a slight ridge. The madreporite is prominent, immediately adjoins the centro-dorsal area, and measures nearly 2 mm.

The actinal intermediate plates, including the adambulacrals, form the chevrons of seven or eight plates, which appear as five longitudinal rows parallel to the furrow; rows 1 and 2 reach the tip of the ray, the fourth has one plate less than the third and ends seven plates from the end of the adambulacral row. The fifth is composed of small plates close under the infero-marginal ridge, and extends two-thirds the length of the ray. The plates are very distinct, round, convex, and in contact with each other. A plate in the centre of the intermediate area occupies a very prominent position, as if it had been forced upward by the surrounding plates. Proximally, the actinal intermediate plates are twice the size of those at the margin, and have deep pits between them; they carry from five to seven equal webbed spines, and their bases coalesce. On the innermost intermediate plates the spines are placed on the proximal edge, but elsewhere they tend to occupy the centre and become clump-like. Adambulacral plates with four or five

Fig. 3.



Proximal actinal plate with spines.

tall blunt furrow-spines, the two central being the longest; on the actinal surface of these plates there is a second row of from seven to eight spines, arranged as a concave fan, the two centre ones being about equal to the large furrow-spines, and twice as large as those forming the outside of the fan. They are webbed for about half their length. Each mouth-angle has five or six blunt flat spines, the two innermost being the largest, and all are united by a membrane for about half their length. Four slightly smaller and more pointed spines are situated upon the top of each mouth-plate —they are perpendicular and decrease in size distally.

Remarks. The present species has a close resemblance to specimens labelled by Bell *Asterina burtonii*, Gray, from the Philippines. I think it is quite likely that the true *burtonii* of the Indian Ocean is different from that form from the Pacific, and when the species comprising this genus have been revised it may be that the present species will be found to be typical of the Pacific form. The total absence of any prominent plates upon the abactinal surface distinguishes it from the *coronata* group as suggested by Dr. W. K. Fisher (Smithsonian Institution, U.S. Nat. Mus. Bull. 100, vol. iii. 1919, p. 411).

Anthenea pentagonula.

Lamarck, 1815. Hist. des Animaux sans Vertèbres, iii. p. 241.
Perrier, 1875, Rév. Coll. Stellérides Mus. Hist. Nat. Paris in Arch. Zool. expérimt. v. p. 274.

Locality. Amoy.

Remarks. Four specimens from which all colour has disappeared.

Dimensions:—

R. 36 mm., r. 17 mm.; height of disc, 8 mm.
R. 48 mm., r. 22 mm.; " " 10 mm.
R. 56 mm., r. 26 mm.; " " 10 mm.
R. 64 mm., r. 36 mm.; " " 15 mm.

The present specimens are small compared to that in the Paris Museum, which is recorded as having R. 162 mm. The madreporite is always situated in one of the depressions which extend in each interradius from the periphery of the disc to the centre. There are already in the Museum collection two specimens from Tuticorin having R. 76. r. 50; height of disc 28 mm., and R. 55, r. 30; height of disc 18 mm.

Astropecten scoparius.

Valenciennes, MSS. Collection Mus. Hist. Nat. Paris, *vide* Perrier, Rév. Coll. Stellérides Mus. Hist. Nat. Paris, Arch. Zool. expérimt. v. p. 359 (1876).

Locality. Amoy.

Remarks. Three specimens :—

R. 45 mm., r. 12 mm.; height of disc 8 mm.
R. 35 mm., r. 8 mm.; „ „ 7 mm.
R. 35 mm., r. 9 mm.; „ „ 7 mm.

This is the common starfish of Japan. Bell has suggested that *Astropecten zebra,* Sladen, is the same as *Astropecten hemprichii,* M. & Tr., now regarded as synonymous with the present species; but Goto (J. Coll. Sci. Tokyo, xxix. Art. I. p. 119, 1914) has shown that there is no reason to doubt Sladen's species. In the present species the ambulacral spines have a wedge-shaped arrangement, and the madreporite is only 2 mm. distant interradially from the marginal plates.

Ophiocnemis marmorata.

Ophiura marmorata, Lamarck, 1816, Hist. des Animaux sans Vertèbres, ii. p. 543.
Ophiocnemis marmorata, Müller & Troschel, 1842, System der Asteriden.—II. Ophiuridæ, p. 87.

Locality. Fukien.

Remarks. Three very broken specimens; diameter of disc 11 mm., length of an arm 40 mm.; the two other specimens have disc-diameters of 11 mm. and 10 mm., but all the arms are broken.

This is the first time this species has been recorded from China; it has previously been described from the Indian Ocean, Australia, and the Sunda and Mergui Archipelagos.

Ophiothrix marenzelleri.

Koehler, 1904, "Ophiures nouvelles ou peu connues," Mém. Soc. Zool. France, xvii. p. 103.

Locality. Fukien.

Remarks. Two specimens of the same size, diameter of disc 5 mm., length of an arm 15 mm. This species was founded by Koehler on specimens in the Vienna Museum from Japan—it has several times since been reported from there and Australia; but this is, I believe, the first occasion on which it has been recorded from China.

Ophiactis affinis.

Duncan, 1879, J. Linn. Soc. London, xiv. p. 469, pl. x. fig. 23; pl. xi. fig. 24.

Locality. Fukien.

Remarks. Two specimens of equal size, diameter of disc 3 mm.; length of an arm 11 mm.

This is a rare species first described by Duncan from Korea; the type-specimen is in the British Museum Collection. The present specimens are the first to arrive in the Museum since the species was first described in 1879; a single specimen was collected by the 'Albatross,' and two by the 'Siboga.'

Arachnoides placenta.

Echinus placenta, Linnæus, 1758, Syst. Nat. ed. 10, p. 666.
Arachnoides placenta, Agassiz, 1841, Mon. d'Échinodermes vivants et fossiles, Mon. des Scutelles, p. 94.

Locality. Foochow.

Remarks. Two specimens 45 mm. long by 43 mm. wide, and 43 mm. long by 45 mm. wide.

Peronella lesueuri.

Laganum lesueuri, Agassiz, 1841, Mon. d'Echinodermes vivants et fossiles, Mon. des Scutelles, p. 116, pl. xxiv. figs. 3–6.
Peronella lesueuri, A. Agassiz, 1872, Rev. Ech. pt. 1, p. 148.

Locality. Amoy.

Remarks. Two specimens, 72 mm. long by 66 mm. wide and 55 mm. long by 50 mm. wide. This species is already known from China. The petaloid area is more than half the length of the test, and the petals almost closed.

Temnopleurus toreumaticus.

Cidaris toreumatica, Leske, 1778, Add. ad. Klein, p. 155.
Temnopleurus toreumaticus, Agassiz, 1841, Mon. d'Échinodermes vivants et fossiles, Anat. Echnius (Valentin), p. vii.

Locality. One specimen from Fukien and two from Amoy.

Remarks. The former is a fine specimen measuring 35 mm. in diameter, with slender spines, the primaries banded with dark olive-green, though here and there a red and brown banding may also be seen. The two specimens from Amoy measure 30 mm. and 25 mm. respectively, the primary spines, which are nearly all broken off, are rosy pink with dark red bandings and red collars. These specimens well illustrate the diversity of colours obtaining in this species.

Oligometra chinensis.

Austin H. Clark, 1918, Unstalked Crinoids 'Siboga' Exped. p. 130.

Locality. Fukien.

Remarks. Eight specimens, arms and pinnules with purple markings. Dr. Clark writes:—"I was getting rather dubious about the validity of this species, but it seems to be quite all right, and constantly different from *O. serripinna* to the southward."

Correcting Note on Asterina burtonii.

On p. 643 of the June number of this Magazine the following quotation occurs:—"I do not know of any other *Asterina* of the West Indian Ocean," &c. This should have read "of the western Indian Ocean," &c. My friend Dr. Lyman Clarke has pointed this out to me, and I hasten to make the correction, as well as to say how sorry I am for misrepresenting him.—G. A. SMITH, Aug. 6, 1927.

XXXV.—*Genera of* Membracidæ (*Hemiptera*) *transferred to other Families.* By W. E. CHINA.

(Published by permission of the Trustees of the British Museum.)

DURING a recent visit to Australia, Dr. J. G. Myers found amongst the Membracidæ in the Melbourne Museum a Graphosomatid (Pentatomidæ) labelled "*Eufroggattia*, Goding." This specimen he was able to borrow, and he has now kindly allowed me to investigate the matter. The Melbourne Museum specimen proves to be *Deroploa affinis*, Schouteden, described in the Graphosomatinæ in 1905, but, judging by Goding's description and figures, *Eufroggattia tuberculata* is identical with *Deroploa* (*Paraderoploa*) *perkinsi*, Schouteden, described in 1912. Goding's genus, therefore, has priority, but must be transferred from the Membracidæ to the Pentatomidæ. The synonymy will be as follows:—

Family **Pentatomidæ.**

Subfamily *GRAPHOSOMATINÆ.*

EUFROGGATTIA, Goding.

1903. *Eufroggattia*, Goding, Proc. Linn. Soc. N.S.Wales, xxviii. p. 37 (described in Membracidæ).

1912. *Paraderoploa*, Schouteden, Ann. Soc. Ent. Belg. lvi. p. 354 (described as subgenus of *Deroploa*, Westwood, 1834, Pentatomidæ) (syn. nov.).

Genotype. *Eufroggattia tuberculata*, Goding: New South Wales.

Eufroggattia tuberculata, Goding.

1903. *Eufroggattia tuberculata*, Goding, *tom. cit.* p. 38, pl. i. figs. 17, 18, & 19.
1912. *Deroploa* (*Paraderoploa*) *perkinsi*, Schouteden, *tom. cit.* p. 354 (syn. nov.).

Although the genus *Porcorhinus*, Goding, was transferred from the Membracidæ to the Jassoidea by the present writer in 1924, this genus still appears as a Membracid in Funkhouser's recent 'Catalogue of Membracidæ' *. It has therefore been thought advisable to draw attention again to the correct systematic position and synonymy of this genus:—

Superfamily **JASSOIDEA.**

Family **Ledridæ.**

PORCORHINUS, Goding.

1903. *Porcorhinus*, Goding, Proc. Linn. Soc. N.S.Wales. xxviii. p. 38 (described in Membracidæ).
1917. *Gudwana*, Distant, Ann. & Mag. Nat. Hist. (8) xx. p. 189 (described in Jassidæ, subfam. Ledrinæ).
1924. *Porcorhinus*, China, Entomologist, lvii. p. 144 (transferred from Membracidæ to Jassoidea).

Genotype. *Porcorhinus mastersi*, Goding: New South Wales.

It is not possible, without seeing Goding's type-specimen, to state whether *Gudwana typica*, Distant, is conspecific with *Porcorhinus mastersi*, Goding. If not, Distant's species must be known as *Porcorhinus typica.*

The genera *Williamsiana*, Goding (1926), and *Eustollia*, Goding (1926), have also recently been transferred from the Membracidæ to the Jassoidea, family Cicadellidæ (Ann. & Mag. Nat. Hist. (9) xix. p. 625, 1927).

The above four genera all appear as Membracidæ in Funkhouser's recent Catalogue.

---

* W. D. Funkhouser, 'General Catalogue of Hemiptera, Membracidæ' (Smith College, Northampton, Mass., U.S.A.), 1927.

XXXVI.—*Preliminary Remarks on Melichar's "Monographie der Cicadellinen" (Hemipt. Jassoidea).* By W. E. CHINA.

(Published by permission of the Trustees of the British Museum.)

THREE parts of Melichar's "Monographie der Cicadellinen" have already appeared in the 'Annale Musei Nationalis Hungarici' in the following order:—

Part I. A. M. N. H. xxi. pp. 195–243 (1924).
Part II. A. M. N. H. xxii. pp. 329–410 (1925).
Part III. A. M. N. H. xxiii. pp. 273–394 (1926).

In this work Melichar proposes ninety-four new genera and four new subgenera. It is not possible yet to go into the question of the status of each of these genera, but it is necessary at once to rename all the genera which have been given preoccupied names before these become widespread in impending catalogues and literature. This work has been undertaken at the request of Professor C. F. Baker of Los Baños, Philippine Islands, to whom the standard lists of genera were not available.

Of the ninety-eight genera and subgenera described, thirteen have been given preoccupied names and three have been wrongly quoted as new. Of these, eight have not yet been validly described, since the names appear in the generic diagnosis (Part III. pp. 340–345), without mention of species. It is, therefore, useless to rename these eight genera until the descriptions are completed in Part IV. of the Monograph, which will presumably be published in the near future.

The following is a complete list of the preoccupied genera, with references to the genera which have priority over them:—

Anchura, Mel. Mon. Cicad. iii. p. 344 (1926).

Not yet validly described, but preoccupied by *Anchura*, Conrad, Philad. Ac. Nat. Sci. Journ. (2) iv. p. 284 (1860) (Mollusca).

Apogonia, Mel. Mon. Cicad. iii. p. 344 (1926).

Not yet validly described, but preoccupied by *Apogonia*, Kirby, Trans. Linn. Soc. London, xii. p. 401 (1818) (Coleoptera).

Bharata, Mel. Mon. Cicad. iii. p. 341 (1926).

This is wrongly quoted in the generic diagnosis as a new genus, but on p. 369 it is correctly referred to as *Bharata*, Dist., 1918.

Catagonia, Mel. Mon. Cicad. iii. p. 342 (1926).

Not yet validly described, but preoccupied by *Catagonia*, Brauer and Von Bergenstamm, Denkschr. Akad. Wien, lviii. p. 348 (1891) (Diptera); also *Catagonia*, Kolbe, Ent. Nachr. xxv. p. 57 (1899) (Coleoptera).

Centrometopia (subgenus), Mel. Mon. Cicad. ii. pp. 370 & 399 (1925).

Preoccupied by *Centrometopia*, Ragonat, Ann. Soc. Ent. France, (6) vii. p. 236 (1887) (Lepidoptera).

Cephalogonia, Mel. Mon. Cicad. iii. p. 342 (1926).

Not yet validly described, but preoccupied by *Cephalogonia*, Wollaston, Journ. of Ent. i. p. 442 (1862) (Coleoptera).

Dichometopia (subgenus), Mel. Mon. Cicad. ii. pp. 370 & 406 (1925).

Preoccupied by *Dichometopia*, Schiner, 1868 (Diptera) (*fide* Scudder). I am unable to trace this genus, and it is possible that Scudder is in error.

Entogonia, Mel. Mon. Cicad. iii. pp. 342 & 360 (1926).

Preoccupied by *Entogonia*, Warren, Nov. Zool. xi. p. 12 (1904) (Lepidoptera).

Eugonia, Mel. Mon. Cicad. iii. p. 342 (1926).

Not yet validly described, but preoccupied by *Eugonia*, Hübner, Verz. bek. Schmett. p. 36 (1818) (Lepidoptera); also *Eugonia*, Hübner, *tom. cit.* p. 291 (1825) (Lepidoptera); also *Eugonia*, Baly, Trans. Ent. Soc. London, 1879, p. 241 (Coleoptera).

Karasekia, Mel. Mon. Cicad. iii. p. 345 (1926).

This is apparently wrongly quoted as a new genus. It is evidently the *Karasekia* of Melichar, Ergeb. 2 Deutsch. Zentr. Afr. Exp. i. 5, p. 117 (1914), which is, however, not a Cicadellinid, but belongs to the Gyponidæ, subf. Hylicinæ.

Heterometopia (subgenus), Mel. Mon. Cicad. ii. pp. 370 & 386 (1925).

Preoccupied by *Heterometopia,* Macquart, Mem. Soc. Roy. Sci. Agr. Arts, Lille, 1844, p. 298; also in Dipt. Exot., Suppl. i. p. 170 (1846) (Diptera).

Heterostemma, Mel. Mon. Cicad. i. pp. 198 & 227 (1924).

Preoccupied by *Heterostemma* in Coleoptera (*fide* Scudder). Since I am unable to trace this genus, and neither author nor date is given in Scudder, it is best to regard this as a valid genus.

Oxygonia, Mel. Mon. Cicad. iii. p. 344 (1926).

Not yet validly described, but preoccupied by *Oxygonia,* Mannerheim, Bull. Mosc. ii. p. 17 (1837) (Coleoptera); also *Oxygonia,* Fairmaire, Ann. Soc. Ent. France, (2) iv. p. 301 (1846) (Hemiptera).

Paragonia, Mel. Mon. Cicad. iii. p. 342 (1926).

Not yet validly described, but preoccupied by *Paragonia,* Hübner, Verz. bek. Schmett. p. 292 (1825) (Lepidoptera).

Parametopia (subgenus), Mel. Mon. Cicad. ii. pp. 370 & 387 (1925).

Preoccupied by *Parametopia,* Reitter, Nitid. Japans. 1884, pp. 259 & 262.

Splonia, Mel. Mon. Cicad. i. p. 201 (1924), ii. p. 359 (1925).

This genus is not new, but is apparently the same as *Splonia,* Signoret, Ann. Soc. Ent. France, 1891, p. 467. The genotype is also *S. acutalis,* Sign., from Senegal, not *S. acutalis,* sp. n.

The following new names are hereby proposed:—

Molomea, nom. nov. for *Centrometopia,* Mel., 1925, *nec* Ragonot, 1887 (Lepidoptera).

Egidemia, nom. nov. for *Dichometopia,* Mel., 1925, *nec* Schiner, 1868 (Diptera); *fide* Scudder.

Sibovia, nom. nov. for *Entogonia,* Mel., 1926, *nec* Warren, 1904 (Lepidoptera).

Hyogonia, nom. nov. for *Heterometopia,* Mel., 1925, *nec* Macquart, 1844 (Diptera).

Lebora, nom. nov. for *Parametopia,* Mel., 1925, *nec* Reitter, 1884 (Coleoptera).

XXXVII.—*A new Species of* Notonecta *from North Africa, with a Note on the Synonymy.* By TEISO ESAKI.

WHILE examining the collection of aquatic Hemiptera of the National Museum of Natural History in Paris, I came across three specimens of an apparently undescribed species among a large number of *Notonecta glauca*, Linné, and its allied species. These specimens were determined by Kirkaldy as "*Notonecta glauca*, var. *maculata*," from which, however, they are quite distinct, and here I describe the species as new to science. My sincere thanks are due to Prof. E.-L. Bouvier and to Dr. E. Séguy for their generosity in allowing me to study and describe the species.

Notonecta horváthi, sp. n.

Medium in size, smaller but stouter in shape than *N. glauca*, Linné.

Body concolorous, pale sordid brown. Eyes pale brown, shining; apex of rostrum brown. Along the costal margin of elytra and along the vein between corium and clavus there are irregular, obscure, dark brown markings, which are much reduced in the male specimen. Underside of body black with pale brown hairs. Legs pale sordid brown, claws black.

Body comparatively stout. Head rather large, eyes large. Vertex constricted at the base; anterior breadth of vertex : synthlipsis = 8 : 3. Pronotum transverse, comparatively much shorter than in *glauca* or in *lutea*; lateral ridges more oblique than in *glauca* and slightly longer than eye seen from side, while in *glauca* they are considerably longer than eye (figs. 2, 3). Scutellum much shorter than in *glauca*, more strongly narrowed towards the apex. Membrane divided into two nearly equal parts along the median longitudinal line, the apex of the basal portion is more angularly and more posteriorly projecting than that of the apical half; in *glauca* apices of both the portions are of the same shape (figs. 4, 5). Mesotrochanter rounded as in *glauca*.

Length of body, ♂ 12·5, ♀ 13 mm.; breadth of body at the base of pronotum, ♂ 4, ♀ 4·5 mm.

Hab. Tanger, Morocco.

Holotype ♂, allotopotype ♀, paratopotype ♀, Tanger (*Favier*, 1856), in the National Museum of Natural History, Paris. There are also three paratypes of this species in rather bad condition from two different unknown localities in the British Museum, London.

This species is named in honour of Dr. G. Horváth, of Budapest.

Apart from the above-mentioned characters, this species is at once distinguished from the *glauca*-group of *Notonecta* by

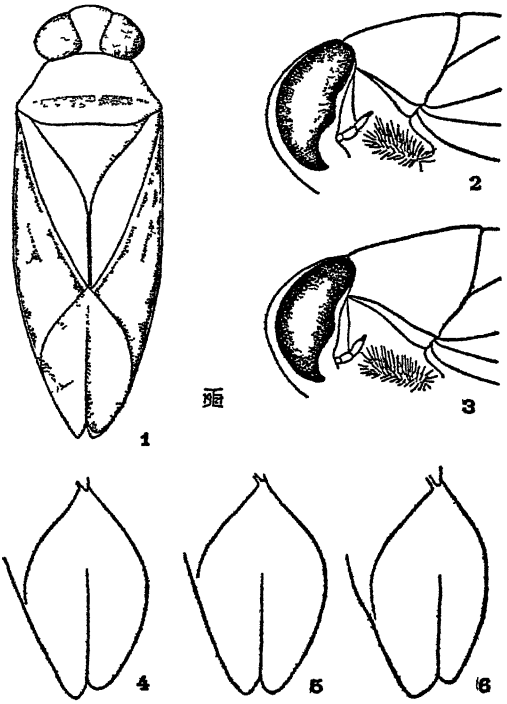


Fig. 1.—*Notonecta horváthi*, sp. n.
Fig. 2.—Ditto. Lateral view of pronotum and eye.
Fig. 3.—*Notonecta glauca*, Linné. Lateral view of pronotum and eye.
Fig. 4.—*Notonecta horváthi*, sp. n. Membrane of left elytron.
Fig. 5.—*Notonecta glauca*, Linné. Membrane of left elytron.
Fig. 6.—*Notonecta lutea*, Muller. Membrane of left elytron.

the concolorous body and scutellum. In the *glauca*-group the scutellum is always totally black*. In this character

---

* In his description of "*Notonecta maculata*, F." ('Illustratio Iconographica Insectorum quæ in Musæis parisinis observavit et in lucem edidit Joh. Christ. Fabricius,' Paris, 1799, p. 38), Coquebert wrote "scutellum album," though in his figure (tab. x. fig. 1, A) the scutellum is *hand-painted* totally black. (I have seen two copies of this work in the British Museum, London, and in the Hungarian National Museum, Budapest, respectively.) This specimen was collected in Paris, and should now be preserved in the National Museum of Natural History,

N. horváthi is allied to *N. lutea*, Müller[*], and *N. borealis*, Bueno et Hussey, but is distinguished from these species by its smaller size, less stout shape, by the shape of membrane, which, unlike that in *lutea* and *borealis* (figs. 4, 6), is divided into two nearly equal parts, and by the other characters.

In 1925 I described a new *Notonecta* from Amur and Ussuri as *N. bergrothi*[†], and a few months later in the same year the same species was described by H. B. Hungerford from China under the name *N. suensoni*[‡]. Later on I had the opportunity of examining the collection of the National Museum of Natural History, Paris, in which I found three specimens of this species from "Se-Tchouen," "Kiang-si," and "Chen-si," China, respectively. These specimens had been studied and determined by Kirkaldy as "*Notonecta chinensis*, Fallou, var." (1897). Judging from the localities of the specimens and Kirkaldy's statement, however, there is practically no doubt that these specimens are the types of his *Notonecta chinensis*, Fallou, var. *kiangsis*, Kirkaldy[§], though this variety name is not cited on the labels of the specimens. In describing *N. bergrothi* I referred the species to the description of *kiangsis* (*vide loc. cit.* p. 15), but it was almost impossible to identify it with *kiangsis*, as Kirkaldy's description is very poor. This species should thus be synonymized as follows:—

Notonecta kiangsis, Kirkaldy, 1897
(described as a variety of *N. chinensis*, Fallou).

=*Notonecta bergrothi*, Esaki, 1925.
=*Notonecta suensoni*, Hungerford, 1925.

This species is now known to be widely distributed in Central and North-eastern China and East Siberia. There are also many specimens from South Ussuri, collected at the

---

Paris; but, although considerable time was spent there in an effort to trace his type, I was unable to find it. Most probably, however, this statement was written in error by Coquebert.

[*] In *Notonecta lutea*, Müller, var. *scutellaris*, Reuter, the scutellum is obscurely black at the base. One of the types of this variety from Sommatti, Finland, is now kept in Sahlberg's collection in the Zoological Laboratory of the Finnish University, Åbo (Turku). This variety is found as a rarity in Finland, Northern Russia, and East Siberia.

[†] Described and figured in Notul. Entom., Helsingfors, v. p. 14 (1925), and figured also in Entom. Mitt., Berlin-Dahlem, xiv. p. 313 (1925).

[‡] Described in Ann. Entom. Soc. America, Columbus, xviii. p. 417 (1925). See also the note in the same journal, xix. p. 92 (1926).

[§] Described in Trans. Entom. Soc. London, 1897, p. 416 (1897).

same time as one of the paratypes of *N. bergrothi*, Esaki, in the Zoological Museum of the Academy of Sciences, St. Petersburg (Leningrad), and a single specimen from "China meridionalis" in the Hungarian National Museum, Budapest.

XXXVIII.—*On further Monkeys of the* Callicebus torquatus *Group.* By OLDFIELD THOMAS.

EARLIER in the present year * I gave an account of some yellow-headed Titi monkeys from the Rio Solimões received from Herr W. Ehrhardt, and gave a synopsis of the five subspecies of *Callicebus torquatus* which I thought might be recognized.

Herr Ehrhardt has now sent four further specimens of this interesting group, two of which—from Fonte-Boa and Santarita—may be referred to *Callicebus torquatus regulus*, one from the Rio Tonantins to *C. t. lucifer*, while the fourth would appear to represent an additional subspecies allied to *C. t. torquatus*, and may be described as follows:—

Callicebus torquatus ignitus, subsp. n.

Most closely allied to *C. t. torquatus*, with which it agrees in the rufous under surface and inner aspect of thighs, but distinguished by the whole upper surface being deep rich rufous, without any superficial darkening of the hairs, this rufous carried down on to the tail, of which only the terminal hairs are a little darker at their tips; the outer side of the legs from the middle of the tibia downwards black instead of rufous, and the feet wholly black without any suggestion of red on the metatarsals. The yellow on the hands less in extent than usual, only taking in the digits and not the metacarpals, while in *torquatus* it includes the whole hand. White collar, as in *torquatus*, comparatively inconspicuous.

Size apparently as usual, but the type is immature.

Head and body 320 mm.; tail 380.

Skull: greatest length 60.

Hab. Rio Tonantins, Upper Solimões.

Type. Immature male. B.M. no. 27. 8. 11. 4. Original number 466. Collected 30th September, 1926.

No doubt near true *C. torquatus* of the Lower Solimões, but recognizable by the more brilliantly rufous general colour, the red tail, and the blackened lower limbs.

---

* Ann. & Mag. Nat. Hist. (9) xix. p. 509.

XXXIX.—*On Bornean Specimens of the Teledu* (Mydaus).

By OLDFIELD THOMAS.

BY the kindness of Mr. E. Banks of the Sarawak Museum I have been privileged to examine a number of the skins, skulls, and skeletons of *Mydaus* on which in 1925 Prof. Lönnberg and Dr. Mjöberg* founded a special species—*M. luciferoides*—from the Kalabit plateau, near Mein, in North-eastern Sarawak. I have also before me the type-specimen of *M. javanensis montanus*, Moulton†, from the same locality, besides the type of *M. lucifer*, described by myself in 1902‡.

There has been some controversy about the relative value of the different forms described, and therefore, now that specimens of all of them are directly comparable, it seems advisable that the result of a comparison should be published.

The Mjöberg series being a very fine one, containing a number of males and an adult female, I am in a position to state, firstly, that the female is indistinguishable by any character of importance from the typical female of *M. lucifer*, and, secondly, that among the males there are individuals precisely agreeing with the type of *montanus*.

In consequence, both *montanus* (1921) and *luciferoides* (1925) should be considered as synonyms of *M. lucifer* (1902).

But, further, now that a good series of the Bornean animal is available for comparison with the fine series of *M. javanensis* obtained by Mr. Shortridge near Buitenzorg in 1907—no such series having existed when I described *lucifer* in 1902,—I am able to state that as a species the Bornean *M. lucifer* is distinguishable from the Javan *M. javanensis* by its decidedly larger size and longer and more heavily tufted tail. On the other hand, both the direction of the nape-hairs and the details of the colour-markings prove to be too variable for definite diagnosis, although in a general way it may be said that the dorsal white line is, on the average, better developed in *M. lucifer* than in *M. javanensis*, running down on to the longer and more conspicuously white-tufted tail.

Male and female specimens of this interesting animal from the Mjöberg series have been presented to the National Museum by the Sarawak Museum. The respective lengths of their skulls are 105 and 86 mm., corresponding skulls of *M. javanensis* measuring 97 and 82 mm.

---

* Ann. & Mag. Nat. Hist. (9) xvi. p. 509 (1925).
† Journ. Straits Branch Roy. Asiat. Soc. no. 83 (1921).
‡ Ann. & Mag. Nat. Hist. (7) ix. p. 442 (1902).

XL.—*A Revision of the Genera and Species contained in Lendenfeld's 'Die Chalineen des australischen Gebietes.'* By MAURICE BURTON, M.Sc.

THE notes contained in the following pages are the first of a series which it is hoped will be published from time to time, with the desire of eliminating the confusion into which Lendenfeld's memoir on the Chalininæ of the Australian Seas has thrown the systematic arrangement of that group. It is fortunate that a large number of that author's type-specimens are now in the British Museum. It will be impossible in many cases to do more than make a few notes as to the value of some of the species, for there can be little doubt that many of Lendenfeld's type-specimens were nothing more than thoroughly beach-worn specimens, often completely devoid of any microscleres they may have possessed. Some, again, are but fragments. In many cases his description of the skeleton was quite erroneous. Where it is possible to recognize a species by the descriptions available to us in our literature, I have regarded them as valid. Where this is not possible, but sufficient material is to hand to enable me to do so, I shall include a re-description. In all other cases the species will be regarded as *sp. dub.* and set aside as valueless until such time as our knowledge of these species may be extended. In some cases I fear this may never occur.

As often as is possible I shall endeavour to make a survey of the genus in question at the same time as the species described by Lendenfeld are dealt with.

A full list of references to the literature consulted will be published at the conclusion of this series.

I. THE GENUS *CACOCHALINA*, O. SCHMIDT, 1868 A, P. 37.

Genotype: *C. subtilis*, Schmidt, 1870 A, p. 33.

The genus was first mentioned by Schmidt in 1868, when he suggested that it be used for sponges, belonging to the Chalininæ, with the external form of a *Cacospongia*. No species were named until two years later, when two were inadequately described from the Gulf of Mexico. The first of these was *C. subtilis*, which, since none has previously been named, I now regard as the type-species. The British Museum possesses a microscopic preparation from the holotype, but it is so poor that it is impossible to gauge accurately the character of the skeleton from it. Schmidt's description is also much too inadequate to give any further clue. This sponge is a Chalinine undoubtedly, but further than this it is not possible to state with any degree of certainty. For the time being, and pending a re-description of the holotype from better material than I have at my disposal, I would suggest that the genus be regarded as insufficiently characterized and the use thereof abandoned. The fate of the various species hitherto assigned to it is discussed below.

1. *Cacochalina calyx*, Keller, 1889 A.

From its author's description there can be little doubt that this cup-shaped or tubular sponge with a reticulate skeleton of styli and spongin is none other than *Phakellia donnani* (Bowb.), a species very common in the Red Sea and vicinity.

2. *Cacochalina digitata* (Schmidt), Czerniavsky, 1879 A.

The reticulate skeleton of spongin fibres and styli of this species suggest that it may be either the reduced form of some Esperelline genus or an Axinellid for which a new genus may possibly be required. Provisionally I regard it as *Axinella digitata.*

3. *Cacochalina globosa*, Lendenfeld, 1887 E.

This species has been already transferred to the genus *Chalina* by Whitelegge (1901 A). The British Museum possesses the holotype figured by Lendenfeld (*l. c.* pl. xviii. fig. 1). From the examination of this it would appear necessary to place the species in *Acervochalina.* This is a species which may be readily recognized from its author's figure and Whitelegge's re-description.

4. *Cacochalina inornata* (Bowb.), Lendenfeld, 1887 E.

This species is closely related to *C. digitata*, Schmidt, and must share the same fate.

5. *Cacochalina irregularis*, Czerniavsky, 1878 A.

From his description there can be little doubt that Czerniavsky's species is very like *C. limbata*, Bowb., if not actually synonymous with it.

6. *Cacochalina limbata* (Bowb.), Levinsen, 1887 B.

This species has been taken as genotype for *Acervochalina*, a genus which it is now proposed be retained.

7. *Cacochalina macrorhaphis*, Lendenfeld, 1887 E.

I have seen neither a specimen nor a microscopic preparation of the species, and, since Lendenfeld's descriptions in the work quoted above are so utterly unreliable, there is nothing left to do than to take his description of the species at its face value until such time as revision thereof is forthcoming. It must be regarded as a *Chalina*?, sp. dub.

8. *Cacochalina maculata*, Keller, 1889 A.

This appears to be a *Cladochalina* with a special dermal skeleton, characterized by the presence of sand in the fibres and strongyles as the only spicule-form present. The two last-named characters, although unusual for the Chalininæ, are not unknown to me from Red Sea examples of that family. I have known them to occur on two occasions in specimens belonging to a species which ordinarily possesses oxea and no foreign inclusions in the fibres.

9. *Cacochalina mollis*, Topsent, 1897 A.

In my opinion this species should be placed in *Acervochalina*, although one cannot be sure without seeing the actual specimen or a figure thereof.

10. *Cacochalina pandæa*, Lendenfeld, 1887 E.

A fragment of the holotype is in the British Museum Collection, from which it may be seen to be a true Chalinine with a special dermal skeleton. Its nearest allies are to be found among the species of *Placochalina*.

11. *Cacochalina rubiginosa*, Schmidt, 1870 A.

A species insufficiently characterized, for which we must await a re-description.

12. *Cacochalina rubra*, Lendenfeld, 1887 E.

My remarks concerning *C. macrorhaphis* apply equally here.

13. *Cacochalina subtilis*, Schmidt, 1870 A.

The only evidence available as to the characters of this, the genotype, is in a very poor microscopic preparation—so poor, indeed, as to make it worthless to endeavour to piece together the scanty evidence it affords. Undoubtedly it is a Chalinine and has some resemblance, so far as the structure of the skeleton is concerned, to the repent British Chalinas (e. g., *C. montaguii*, Bowb.), but further than this nothing can be said.

14. *Cacochalina truncatella*, Lendenfeld, 1887 E.

This species is composed of two varieties. Var. *laxa* was very evidently a thoroughly beach-worn specimen, as so many of the sponges described by this author in the work quoted were. The remains of the skeleton consist of a stout reticulation of spongin cored by numerous subtylostyli. These spicules have the same shape as the megascleres of *Mycale serpens* (*vide* Hallmann, 1914 c, pp. 406–408), and measure on an average 0·18 by 0·003 mm. I can only suggest that this variety, like *Arenochalina mirabile*, Lendf. (*vide* Hallmann, 1914 c, p. 399), is a beach-worn *Mycale* which has lost all spicules but the megascleres.

C. truncatella, var. *mollissima*, possesses a stout reticulation of spongin-fibres containing polyserially arranged amphistrongyles like those figured by Hentschel (1911 A, p. 326) for *Batzella inæqualis*, with which species the present variety is probably synonymous. The spicules in var. *mollissima* measure 0·175 by 0·003 when fully grown.

15. *Cacochalina typica*, Lendenfeld, 1887 E.

I have seen no material of this species, but to take the author's description at its face value it appears to be a *Batzella*, very much like the foregoing.

16. *Cacochalina velinæ*, Lendenfeld, 1887 E.

With no material available, and only the author's description to depend on, I regard this as a *Chalina* ?, sp. dub.

SUMMARY OF THE SPECIES OF *CACOCHALINA* AND THEIR PRESENT SYSTEMATIC POSITION.

C. calyx = *Phakellia donnani* (Bowb.).
C. digitata = *Axinella digitata* (Schmidt).
C. globosa = *Acervochalina globosa* (Lendenfeld).
C. irregularis = *Acervochalina limbata* ?
C. limbata = *Acervochalina limbata* (Bowb.).
C. macrorhaphis = *Chalina* ?, sp. dub.
C. maculata = *Cladochalina maculata* (Keller).
C. mollis = *Acervochalina mollis* (Topsent).
C. pandæa = *Placochalina* ? *pandæa* (Lendenfeld).

C. rubiginosa = *Cacochalina*, sp. dub.
C. rubra = *Chalina*?, sp. dub.
C. subtilis = sp. dub.
C. truncatella, var. *laxa* = *Mycale* sp.
C. truncatella, var. *mollissima* = ? *Batzella inæqualis*, Hentschel.
C. typica = *Batzella* ? *typica* (Lendenfeld).
C. velinæ = *Chalina* ?, sp. dub.

II. THE GENUS *CHALINOPORA*, LENDENFELD, 1887 E.

Genotype : *Acervochalina claviformis*, Carter, 1886 H.

In this genus, again, no genotype has hitherto been named, so that the first species mentioned in connection with the genus is chosen.

1. *Chalinopora claviformis* (Carter), Lendenfeld, 1887 E.

This species, originally placed in the genus *Acervochalina* by Carter, has been successfully removed thence to *Chalinopora* and, finally, to *Pachychalina* by Dendy (1895). To my mind it belongs quite definitely to neither the first nor the last, but to the genus *Halichondria*. *Chalinopora* must of necessity be regarded as a synonym of that genus. Descriptions of the species are given by the three authors named, so that there should be no difficulty in recognizing it. The only point which concerns us here is its systematic position. The sponge is friable, with a definite dermal skeleton formed of a delicate reticulation of oxea. The ectosome containing this skeleton is readily detachable. In appearance the sponge is very like the members of the genus *Halichondria*, particularly those species found in the Indo-Pacific areas. The main skeleton is a very irregular reticulation, almost halichondroid, of oxea. There is no distinction into primary and secondary fibres such as one would expect in the genera *Acervochalina* and *Pachychalina*. The possession of a dermal skeleton at once demands its removal from the former. Some of the fibres of this irregular reticulation are multispicular, formed of a spongin-fibre containing multiserially arranged spicules, while some are unispicular. Others, both multispicular and unispicular, are devoid of spongin. The main skeleton is best described as halichondroid with more spongin than is usual for that genus. This to my mind by no means prevents its being placed in the genus *Halichondria*. There is a dermal skeleton composed of a reticulation of usually single oxea forming a polygonal to triangular network. The ends of the spicules only are cemented together by spongin. In texture and appearance this species is very strongly suggestive of such species as *Petrosia seychellensis*, Dendy, *Reniera cribricutis*, Dendy, *R. semifibrosia*, Dendy, all of which must be regarded as belonging to *Halichondria*, *Halichondria retiderma*, Dendy, and *H. nigra*, Dendy. In fact, the only thing which can be called, and somewhat doubtfully at that, a real difference between these species and *Chalinopora claviformis* is the presence of a little more spongin in the skeleton of the latter, and I hardly think such a difference can be of generic or even specific importance.

2. *Chalinopora retepora*, Lendenfeld, 1887 E.

This species is a flabellate *Phakellia* with a skeleton composed of a reticulation of horny fibres cored by styli.

3. *Chalinopora tenella* and *C. lutea*.

Of these two species I have no information. Dendy has mentioned the former, but gives no further information as to the characters of its skeleton, certainly not of the dermal skeleton. Under the circumstances I shall regard them as *Cladochalina* ?, sp. dub.

The remaining species of the genus all have both main and dermal skeletons similar to those of *Cladochalina armigera*, and will accordingly be placed in the same genus. Many of these species will probably prove to be synonymous with older species, or even synonyms the one of the other, but for the time being they will be treated as valid species.

SUMMARY OF THE SPECIES OF THE GENUS *CLADOCHALINA* AND THEIR PRESENT SYSTEMATIC POSITION.

C. claviformis = *Halichondria claviformis* (Carter).
C. conulata = *Cladochalina armigera*, Schmidt.
C. intermedia = *Cladochalina subarmigera*, Ridley.
C. lamella = *Cladochalina lamella*, Lendenfeld (1887 E).
C. laxa = *Cladochalina laxa* (Lendenfeld).
C. lutea = *Cladochalina* ?, sp. dub.
C. paucispina = *Cladochalina paucispina* (Lendenfeld).
C. raphidiophora = *Cladochalina raphidiophora* (Lendenfeld).

C. retepora = *Phakellia retepora* (Lendenfeld).
C. siphonopsis = *Cladochalina siphonopsis* (Lendenfeld).
C. subarmigera = *Cladochalina subarmigera* (Ridley).
C. tenella = *Cladochalina* ?, sp. dub.
C. truncata = *Cladochalina truncata* (Lendenfeld).
C. typica et varr. = *Cladochalina typica* (Lendenfeld).

III. THE GENUS *CLADOCHALINA*, O. SCHMIDT, 1870 A.

Genotype : *Tuba armigera*, Duch. & Mich., 1864.

The genus is composed at the present time of eleven species and one variety, of which seven species are described as new by Lendenfeld (1887 E). It will be convenient then to examine the remaining species at the same time as those of Lendenfeld. All species belong truly to the genus (that is, they correspond in their characters to the genotype), although many have from time to time been removed to other genera.

SUMMARY OF THE SPECIES OF *CLADOCHALINA* AND THEIR PRESENT SYSTEMATIC POSITION.

Since all the species actually belong to this genus, no comment will be made except in special cases, as, for example, when the species is obviously synonymous with another species.

1. *C. armigera* (Duch. & Mich.), Schmidt.
2. *C. aurantiaca*, Lendenfeld, 1887 E.
3. *C. dendroides*, Lendenfeld, 1887 E.
4. *C. diffusa*, Lendenfeld, 1887 E.
5. *C. elegans*, Lendenfeld, 1887 E.
6. *C. euplax*, Lendenfeld, 1887 E.

[This species is regarded by Whitelegge (1901 A) and Dendy and Frederick (1924) as a synonym of *Chalina palmata*, which species is also an undoubted *Cladochalina*.]

7. *C. mammillata*, Lendenfeld, 1887 E.
8. *C. mollis*, Lendenfeld, 1887 E.
9. *C. nuda*, Ridley, 1884 C.

[This species was placed in *Ceraochalina* and later *Chalina* by Lendenfeld (1887 E) and Hentschel (1912 A), respectively.]

10. *C. nuda*, var. *abruptispicula*, Ridley, 1884 C.
11. *C. pergamentacea* (Ridley).

[This species was originally described as *C. armigera*, var. *pergamentacea*, by Ridley (1884 c), and has since appeared under the following names: *Ceraochalina papillata*, Lendenfeld (1887 E), *C. pergamentacea*, Keller (1889), Dendy (1895, 1924 A), *Chalina pergamentacea*, Ridley & Dendy (1887). All these must now be considered as synonyms of *Cladochalina pergamentacea*.]

12. *C. subarmigera*, Ridley, 1884 c.

[The species has been known as *Chalinopora subarmigera*, Lendenfeld (1887 E), and *Chalina subarmigera*, Lindgren (1898). These are now synonyms of the species.]

13. *C. tenuirhaphis*, Lendenfeld, 1887 E.

IV. THE GENUS *CHALINELLA*, LENDENFELD, 1887 E.

Genotype: *C. macropora*, Lendenfeld, *l. c.*

Only two species are contained in the genus, *C. macropora* and *C. tenella*, both of which are synonymous with *Cladochalina elegans*, Lendf. The genus becomes therefore a synonym of *Cladochalina*.

XLI.—*A new Species of* Sparnia, *Stål, from South Chile* (Delphacidæ, *Homoptera*). By F. MUIR, Hawaiian Sugar Planters' Experiment Station, Honolulu, T.H.

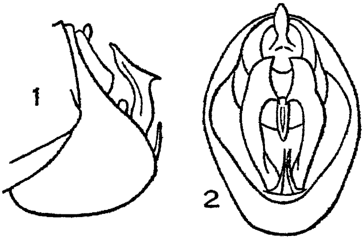
Sparnia edwardsi, sp. n. (Figs. 1 & 2.)

Male.—Brachypterous. Length 2, tegmen 1·7 mm.

Head slightly narrower than thorax, width including eyes 1·8 times the length; vertex a little longer than wide, base distinctly behind middle of eyes and slightly wider than apex, median carinæ indistinct; length of frons 2·3 times the width, the width at apex 1·4 times the width at base, carinæ large, median carina simple; clypeus tricarinate, the median carina obscure. Antennæ nearly as long as frons and clypeus together, first segment long, narrow, flat, without a longitudinal carina, second subequal to first in length, terete. The lateral pronotal carinæ curved, first divergingly, then convergingly, reaching hind margin. Hind basitarsus about equal in length to the other two together, spur subequal in length to basitarsus, with ten teeth on hind margin. Tegmina reaching slightly beyond apex of abdomen; wings rudimentary.

The external appearance of the genitalia is figured, but the ædeagus was not dissected out.

Head yellow, with a few black marks on vertex and basal portion of frons, one forming a small band between eyes, a shiny black band across genæ and frons below the antennæ; clypeus black, with a slight yellow mark in middle and yellow at apex; antennæ dark brown, lighter along the margin of first segment. Pronotum black, the carinæ and lateral margins yellow; mesonotum black, with the carinæ slightly lighter. Legs brown, the femora with a dark longitudinal line, the tibiæ with a thinner line, front and middle tarsi dark brown, hind basitarsi light, other two dark. Tegmina hyaline, clear, apical cells fuscous, a small fuscous mark on commissure on apical third of clavus, a few large dark brown spots on the veins.



Sparnia edwardsi, sp. n.

Fig. 1.—Lateral left side view of male genitalia.
Fig. 2.—Full view of male genitalia.

Three males and five nymphs from Ancud, Chiloe Island, South Chile (*F. and M. Edwards*, 17–19. xii. 1926). In the nymphs the antennæ are not so long and the two segments more uniform than in the adult, and the median carinæ of frons separate for their whole length.

Type in the British Museum.

This is the third species of this genus. The other two—*S. præcellens*, Stål, from Brazil and Ecuador, and *S. williamsi*, Muir, from Ecuador—are closely allied, but the present species is more distinct, but must come into the genus.

XLII.—*A Comparative Study of the Otoliths of the Neopterygian Fishes* (continued). By G. ALLAN FROST, F.L.S., F.G.S., F.Z.S.

[Plate V.]

XVIII. Order PERCOMORPHI.

Suborder PERCOIDEA.

Division 1. PERCIFORMES.

In the division Perciformes the sagitta is large and well developed; the asteriscus and lapillus remain diminutive and without special features.

The sagitta is distinguished by the following features:—Shape long, ovate, or high and sub-circular, the ovate type being the most generalized. Rostrum well developed; antirostrum and excisura slight or absent. Sulcus open on anterior rim, ostium horizontal or with slight upward or downward inclination. Cauda curved, longer than ostium (exceptions *Acerina, Apogon, Cepola*), not reaching posterior rim, when heavily curved ending above ventral rim or open at junction of ventral and posterior rims.

The sagitta of *Perca fluviatilis* (Pl. V. fig. 1), of the family Percidæ, is ovate; the outer side is concave and the inner side convex. The dorsal rim is highest anteriorly, the posterior part is curved and passes into the posterior rim; both these rims are serrated, and in some aged examples the lower part of the posterior rim is produced. The ventral rim is curved and regular with slight serrations. The anterior rim consists of a stout blunt rostrum and a small antirostrum, below which is an excisura; above the antirostrum the rim is oblique. The sulcus is nearly straight; the ostium opens on the anterior rim and occupies half the rostrum; the lower margin is distended, but not the upper margin; there is a lower, but no upper angle; the cauda is longer than the ostium; the end, which is slightly distended and has a slight downward curve, does not reach the posterior rim. The asteriscus is upright, and broadest in its dorsal part, which has a forward projection; the lapillus is oblong and thick.

In *Perca flavescens*, of North America, the sagitta resembles that of *Perca fluviatilis*; it differs in the low dorsal rim, in the broad rounded rostrum, in the deeply curved ventral rim, in the greater curve of the cauda, and in the slight serration of the rims.

In *Acerina cernua* (family Perc entral rims, and in the
fig. 2) is thick and ovate; it differs n *Pagellus centrodontus*
the more regular dorsal rim, the absen r ventral rim. This
or excisura, the distention of the u quently in Tertiary
ostium, and in the cauda, which is disten may be described
longer than the ostium. more elongated

In *Morone labrax*, of the family Serranid
(Pl. V. fig. 3) resembles that of *Perca*. It is the sagitta
elongated and differs slightly in the lower dorsal ape. It
in the median angle to the ventral rim, in the upper a rim,
to the sulcus, and in the more curved cauda. These differences become accentuated with age. All the rims are serrated.

The sagitta of *Morone lineata*, a North American species, resembles that of *Morone labrax*, differing only in the slightly narrower posterior part; the rims are only slightly serrated. That of *Morone americana* resembles the otolith of *Perca flavescens*, and the rims are not serrated. The dorsal rim is straight and is divided by a median cleft, and the otolith is shorter than in *M. labrax* and *M. lineata*.

In *Lateolabrax japonicus* of the family Serranidæ the sagitta resembles that of *Morone labrax*; it differs in its slightly greater height and stouter build.

The otolith of *Epinephelus morio* (fam. Serranidæ) resembles that of *Perca*; it differs in the symmetrical dorsal rim which is highest medianly, in the pointed anterior and posterior rims, and in the beautiful serration of the rims; also in the sulcus, which is more curved and has an upper angle.

In *Kuhlia marginata*, of the family Kuhliidæ, the sagitta (Pl. V. fig. 4) resembles that of *Morone*. It differs in the lower dorsal rim and slightly in the ventral and anterior rims.

The otolith of *Arripis georgianus* (Pl. V. fig. 5), family Arripididæ, resembles that of *Kuhlia*; it differs in the depth and irregularity of the ventral rim and in the absence of angles to the sulcus.

In *Pomatomus saltatrix* (Pl. V. fig. 6) of the family Pomatomidæ the sagitta resembles that of *Kuhlia*; it differs in its greater length, in the dorsal rim which is highest posteriorly, and in the irregular ventral rim.

In *Centropomus undecimalis*, of the family Centropomidæ, the sagitta (Pl. V. fig. 7) resembles that of *Perca* in the anterior height of the dorsal rim and in the obliquity of the upper part of the anterior rim. It differs in the absence of an antirostrum and excisura, in the depth of the rostrum

n the ventral rim which is deepest
concave posteriorly. It also differs
sion of the ostium and strong upper
, and in the more curved and pointed

arifer, of the same family, the otolith re-
of *Centropomus*. It differs in the presence
ostrum and an excisura.

repane punctata (family Drepanidæ) the sagitta
V. fig. 8) resembles that of *Perca* in the dorsal and posterior rims and in the sulcus. It differs in the rounded upturned rostrum and in the ventral rim, which is deep anteriorly and concave posteriorly, as in *Centropomus*.

In *Lutianus chirtah* of the family Lutianidæ (Pl. V. fig. 9) the otolith resembles that of *Perca* in the dorsal rim and in the oblique upper part of the anterior rim. It differs in the absence of an antirostrum and excisura, in the upward distension of the ostium, and in the upper angle to the sulcus, in the curved pointed cauda and in the depth of the ventral rim which is regular and curved, and is not concave posteriorly, as in *Centropomus* and *Drepane*. It also differs in the greater longitudinal curve of the otolith.

In *Gerres rhombeus*, of the family Liognathidæ, the sagitta (Pl. V. fig. 10) resembles that of *Perca;* it differs in the depth of the ventral rim, which is serrated and slightly deeper anteriorly, and in the greater curve of the cauda.

In *Smaris australis*, of the family Mænidæ, the sagitta (Pl. V. fig. 11) is nearly elliptical, it resembles that of *Centropomus* in the sulcus, in the ventral rim which is deepest anteriorly, and in the absence of an antirostrum and excisura. It differs slightly in the cauda, which is nearer that of *Perca*, but is more curved at the end. The posterior rim has a median angle, above and below which it is oblique.

In *Mæna vulgaris*, of the same family, the sagitta (Pl. V. fig. 12) resembles that of *Smaris* in the dorsal and posterior rims, and in the anterior depth of the ventral rim; it differs in the pointed rostrum, in the presence of a slight antirostrum, and in the straighter cauda.

In the family Sparidæ, the sagitta of *Pagellus centrodontus* (Pl. V. fig. 13) resembles that of *Perca*, the sulcus is similar and has no angle of the upper margin. It differs in the greater height of the posterior part of the dorsal rim and in the greater curve of the ventral rim.

In *Pagellus erythrinus* the sagitta (Pl. V. fig. 14) is usually high and sub-circular, though in some examples more elongated. It resembles *Perca* in the dorsal rim, and

Centropomus in the anterior and ventral rims, and in the sulcus. It differs from these and from *Pagellus centrodontus* in the higher dorsal rim and the deeper ventral rim. This high form of Percid otolith occurs frequently in Tertiary formations, and for purposes of reference may be described as the Sparid type, in distinction to the lower more elongated Percid type.

In *Sargus vulgaris*, also of the family Sparidæ, the sagitta (Pl. V. fig. 15) is elongated and pentagonal in shape. It resembles that of *Pagellus erythrinus* in the dorsal rim, which however is lower, in the oblique posterior rim, in the sulcus, and in the absence of an antirostrum and excisura. It differs in the vertical anterior rim, in the shallow straight ventral rim, and in the distension of the end of the cauda. On the outer side the dorsal rim is bent outwards, forming a small flat rounded process, and the anterior part of the ventral rim has also a slight outward inclination.

In *Dentex undulosus* (family Sparidæ) the sagitta (Pl. V. fig. 16) resembles that of *Pagellus centrodontus*. It differs in the high irregular dorsal rim, in the anterior rim, which consists of a large blunt rostrum and has an antirostrum and excisura, and in the broader sulcus in which the cauda is open below the point of the posterior rim. The outer side has dorsal and ventral furrows, giving a fern-like appearance to the otolith.

The otolith of *Cantharus lineatus* (Pl. V. fig. 17), family Sparidæ, resembles that of *Pagellus erythrinus*. It differs in the lower dorsal rim, in the more angular ventral rim, and in the presence of an antirostrum and excisura.

In *Pagrus pugicephalus* (family Sparidæ) the sagitta (Pl. V. fig. 18) is nearly circular. The dorsal and posterior rims are rounded, the latter extending downwards to the level of the ventral rim, which is deepest anteriorly as in *Pagellus erythrinus*. The anterior rim resembles that of *P. erythrinus*, it differs in the presence of a small antirostrum and excisura. The sulcus is broad and not clearly defined, the ostium is depressed, and the cauda is unusually heavily curved and ends close to the ventral rim. The outer side of the otolith is furrowed, as in *Dentex*.

The otolith of *Micropterus salmonoides* (Pl. V. fig. 19), of the family Centrarchidæ, is frail and delicate, and the rims are finely serrated. It resembles that of *Perca*; it differs in the greater obliquity of the anterior rim, in the pointed rostrum, and in the sulcus which resembles that of *Morone*.

In *Hæmulon elegans*, of the family Pomadasidæ, the sagitta (Pl. V. fig. 20) resembles that of *Pagellus erythrinus*; it differs in the sulcus, in which the ostium is more distended, and the cauda is sickle-shaped and ends close to the ventral rim, which is deep and symmetrical.

In *Pristipoma operculare*, of the family Pristipomatidæ, the otolith resembles that of *Hæmulon*, the cauda being, however, more heavily curved and ending against the ventral rim.

In the family Carangidæ the sagitta of *Trachurus trachurus* (Pl. V. fig. 21) resembles that of *Perca* in the sulcus, the cauda differing slightly in length and curvature. The otolith differs in the dorsal rim, which is lower anteriorly, and in the long pointed rostrum, these features resembling those of the "elopine" type. There is a slight antirostrum, but no excisura.

In *Trachurops crumenophthalmus*, of the same family, the sagitta (Pl. V. fig. 22) resembles that of *Trachurus* in the low dorsal rim; it differs in the anterior rim, the rostrum is blunt, inclined upwards and covered by the ostium, below which is a small notch; an antirostrum and an excisura are present. The sulcus, which is without an upper angle, resembles that of *Dentex undulosus*, the cauda opening on the ventral rim.

In *Tilapia zillii*, of the family Cichlidæ, the sagitta (Pl. V. fig. 23) resembles that of *Perca*; it differs in the greater height of the otolith, in the rounded rostrum and vertical posterior rim, in the upper distension and angle of the ostium, and in the down-turned end of the cauda.

In *Sillago sihama*, of the family Sillaginidæ, the sagitta (Pl. V. fig. 24) is aberrant, but resembles the otoliths of the family Sparidæ, in the anterior depth of the ventral rim. The shape is elongated, broad anteriorly and attenuated in its hinder part. The outer side is concave and the inner side convex. The dorsal rim is regular, low and curved, the ventral rim is keeled and deep anteriorly. The posterior rim consists of an outwardly-directed pointed process, and the anterior rim is curved upwards to the level of the dorsal rim, with which it forms an angle. No rostrum, antirostrum, or excisura is present. The sulcus is enclosed, narrow, and undivided; it is bow-shaped and is flush with the surrounding surfaces.

The sagitta of *Apogon melanotænia* (Pl. V. fig. 25), of the family Chilodipteridæ, resembles that of *Acerina* in the sulcus, which is of the Biovate type, differing, however, in the greater upper angle and the more elevated cauda. It differs also in the indented dorsal rim, in the rounded rostrum, and in the ventral rim, which is deepest anteriorly.

The otolith of *Cepola rubescens* (Pl. V. fig. 26), of the family Cepolidæ, resembles closely that of *Apogon;* it differs in the regular dorsal and ventral rims, and in the small size of the cauda, the general shape being nearer that of *Perca.*

The otoliths of the family Sciænidæ are highly specialized, and the sagitta is often of great size and unusually ponderous. Two general forms may be distinguished: a sub-circular, in which the ventral rim is very deeply keeled, as in some Berycid and Sparid fishes (e. g., *Aplodinotus*), and an elongated form as in *Cynoscion,* with many intermediate variations. The shape of the sulcus in all is characteristic of the family. The ostium, which is unusually widely distended, is not excavated, but flush with the surrounding parts, as in *Sillago,* the only indication of its presence being an almost indiscernible line. The cauda may be bent and downwardly directed or club-shaped, and always ends in the closest proximity to the ventral rim.

In *Aplodinotus grunniens,* of this family, the sagitta (Pl. V. fig. 27) is unusually deep and sub-circular in shape, the upper part being the wider, the outer side is flat and has broad vertical ridges, and the inner side is convex. The dorsal rim is low and has two angles in its median part; it forms an angle with the anterior rim and another at its junction with the posterior rim. The ventral rim is very deeply keeled, resembling the otoliths of the Berycidæ. The ostium opens widely on the anterior rim; it is trifoliate, broad, and flush with the surrounding parts. The cauda, which is excavated as in other genera, resembles that of *Hæmulon,* being sharply curved downwards; it is pointed and ends close to the junction of the ventral and posterior rim.

In *Cynoscion nebulosus,* of the same family, the sagitta (Pl. V. fig. 28) is thick and elongated. The dorsal rim is low and curved, the ventral rim is slightly concave, the posterior rim is pointed, and the anterior rim is rounded. The ostium is large, ovate, and flush with the surrounding parts, it embraces the whole of the anterior rim; the cauda is straight anteriorly, curving down at its termination, which is club-shaped, and ends close to the ventral rim.

In a young example of *Mullus barbatus,* of the family Mullidæ, the sagitta (Pl. V. fig. 29) is high and loaf-shaped, the upper part being narrower than the lower part. It differs from that of *Perca* in the dorsal rim, in which the posterior is higher than the anterior part. The ventral rim is curved and serrated, the posterior rim is oblique, and the anterior rim consists of a blunt rostrum and an obtuse antirostrum, below which is a rounded excisura. The ostium resembles that of *Perca*, being without an upper angle, and the rounded cauda resembles that of *Cepola*. In aged examples the otolith becomes elongated and the cauda lengthened.

The sagitta of *Ephippus faber* (Pl. V. fig. 30), of the family Ephippidæ, resembles that of the young form of *Mullus*. It differs in the lower dorsal rim, in the rounded posterior rim, in the large rounded rostrum, and in the more elongated cauda.

In *Psettus argenteus*, of the family Scorpididæ, the sagitta (Pl. V. fig. 31) resembles that of *Perca* in the dorsal and posterior rims and in the sulcus, which is without an upper angle. It differs in the ventral rim, which is keeled anteriorly, as in *Centropomus*, and in the broad upturned rostrum.

In *Brama raii*, of the family Bramidæ, the sagitta (Pl. V. fig. 32) is remarkable for the large pointed rostrum and antirostrum and for the large size of the excisura, in these features differing from the remainder of the otoliths of the division Perciformes, and approaching those of the division Labriformes, in which, however, the excisura is smaller. The dorsal rim resembles that of *Trachurus*, the ventral rim is straight, but is heavily curved laterally; the posterior rim is notched level with the cauda. The anterior rim consists of a rostrum, an antirostrum, and a gaping excisura. The sulcus is ill-defined and shallow, but a bold angle of the lower margin is noticeable; the ostium is slightly indicated on the upper part of the slender rostrum, and the cauda consists of a large ovate depression, from which a groove opens on the posterior rim.

I wish to acknowledge with many thanks the help I have received from Mr. C. Tate Regan, F.R.S., and Mr. J. R. Norman, of the British Museum (Nat. Hist.), in the preparation of the foregoing paper.

SUMMARY.

In the division Perciformes the sagitta of *Perca fluviatilis* is the most generalized. The shape may be ovate or elongated (e.g., *Perca*, *Morone*, etc.), or high and sub-circular, in which case the ventral rim is deep and the cauda is strongly curved (e. g., *Dentex*, *Hæmulon*).

In *Acerina*, *Apogon*, and *Cepola* the cauda is ovate and does not exceed the ostium in length.

In the family Sciænidæ the otoliths are highly specialized,

being large and ponderous, without rostrum, antirostrum, or excisura, and the ostium is flush with the surrounding parts.

Aberrant forms: *Sillago*, *Brama*.

EXPLANATION OF PLATE V.

Fig. 1. *Perca fluviatilis*, × 1½.
Fig. 2. *Acerina cernua*, × 2.
Fig. 3. *Morone labrax*, × 1¼.
Fig. 4. *Kuhlia marginata*, × 2¼.
Fig. 5. *Arripis georgianus*, × 2.
Fig. 6. *Pomatomus saltatrix*, × 1½.
Fig. 7. *Centropomus undecimalis*, × 1¼.
Fig. 8. *Drepane punctata*, × 1½.
Fig. 9. *Lutianus chirtah*, × 1¼.
Fig. 10. *Gerres rhombeus*, × 2.
Fig. 11. *Smaris australis*, × 1½.
Fig. 12. *Mæna vulgaris*, × 2.
Fig. 13. *Pagellus centrodontus*, × 1¼.
Fig. 14. —— *erythrinus*, × 1½.
Fig. 15. *Sargus vulgaris*, × 1¼.
Fig. 16. *Dentex undulosus*, × 1.
Fig. 17. *Cantharus lineatus*, × 2½.
Fig. 18. *Pagrus pugicephalus*, × 1.
Fig. 19. *Micropterus salmonoides*, × 1½.
Fig. 20. *Hæmulon elegans*, × 1½.
Fig. 21. *Trachurus trachurus*, × 1¼.
Fig. 22. *Trachurops crumenophthalmus*, × 2.
Fig. 23. *Tilapia zillii*, × 2.
Fig. 24. *Sillago sihama*, × 1½.
Fig. 25. *Apogon melanotænia*, × 2.
Fig. 26. *Cepola rubescens*, × 2.
Fig. 27. *Aplodinotus grunniens*, × 1.
Fig. 28. *Cynoscion nebulosus*, × 1.
Fig. 29. *Mullus barbatus*, × 4.
Fig. 30. *Ephippus faber*, × 1¼.
Fig. 31. *Psettus argenteus*, × 2.
Fig. 32. *Brama raii*, × 3.

XLIII.—*On the Silurian Coral* Tryplasma rugosum (*Edwards and Haime*). By STANLEY SMITH, M.A., D.Sc., F.G.S., and W. D. LANG, M.A., Sc.D., F.G.S.

(Published by permission of the Trustees of the British Museum.)

[Plate VI.]

I.

In 1851 Edwards and Haime described and figured as "*Eridophyllum? rugosum*" certain phaceloid Corals from the Silurian of Gotland, and contained in the collection of M. E. de Verneuil*. Two specimens were figured—one

---

* Pol. Foss. Ter. Pal., Arch. Mus. d'Histoire Naturelle, Paris, vol. v. p. 425, pl. x. figs. 4, 4 *a*, 4 *b*.

(pl. x. figs. 4, 4 *a*) is apparently lost, the other (pl. x. fig. 4 *b*) is in the Ecole Nationale Supérieur des Mines in Paris, and was lent to us for study by Professor Painvin of that institution, who has kindly allowed us also to cut a section from the base of the specimen and thus to elucidate its structure [*].

We therefore choose the specimen reproduced in pl. x. fig. 4 *b* as the lectotype of *Eridophyllum? rugosum*, Edwards & Haime, and refigure it with the accompanying description. The sections show that it belongs to the genus *Tryplasma*, Lonsdale (1845, in R. I. Murchison and others, 'Geol. Russia in Europe and the Ural Mountains,' vol. i. p. 613—genotype, *T. æquabile*, Lonsdale, *loc. cit.*: here chosen. Edwards and Haime, apparently on the evidence of only the external structure, referred it doubtfully to their genus *Eridophyllum*. This has for its genotype the American Devonian species *E. seriale*, and will be considered later. Externally the parallel phaceloid corallites of *Eridophyllum*, joined at frequent intervals by lateral radiciform outgrowths, resemble those of *Tryplasma rugosum*, but the well-developed carinate septa and axial tube of *Eridophyllum* show sections very different from those of *Tryplasma*, with their degenerate spinous septa. (See Pl. VI. figs. 6–9.)

It should be noted that Edwards and Haime's original description of *Eridophyllum? rugosum* applies to both of the obviously different forms figured respectively as 4 (nat. size), 4 *a* (enlarged), and as 4 *b*. It is as follows:—"Polypiérites longs, grêles, parallèles ou légèrement inclinés, un peu flexueux, serrés. Épithèque très-forte, délicatement striée en travers et dans une direction oblique et ascendante. Crampons forts et bien détachés; les jeunes naissent sur ces prolongements. Il paraît y avoir une vingtaine de cloisons. Diamètre des polypiérites, 3 ou 4 millimètres."

II.

Tryplasma rugosum (Edwards & Haime).
(Pl. VI. figs. 1–7.)

Eridophyllum? rugosum, Edwards & Haime, *loc. cit.*

Diagnosis.—*Tryplasma* with narrow stereozone and about twenty septa of one order only [†].

---

[*] We take this opportunity of thanking Professor Painvin for his ready kindness in thus intrusting us with the specimen and allowing us to cut it.

[†] We have been unable to detect any certain evidence of minor septa in the few transverse sections at our disposal; but, when engulfed in the stereozone, minor septa often are hardly visible.

Description of the Lectotype (Edwards & Haime, *loc. cit.* fig. 4 *b*).—The lectotype consists of a number of corallites united by lateral processes and lying parallel to one another on a flat surface of crinoidal limestone measuring 8 by 5 mm. This rock, consisting of coarse white organic fragments in a greenish-grey matrix, is a familiar lithological type of Gotland limestone. The weathered corallites stand out in high relief; they are straight, cylindrical, and about 3 mm. in diameter. The faintness of their longitudinal and annular striation may be partly due to weathering. The spiniform outgrowths which unite the corallites are horizontal or slightly oblique, usually arise from one side only of any one corallite, and are about 1·5 mm. apart. There are about twenty septa, of one order only, spinose, and about 1 mm. long, though of very unequal lengths. The epitheca is reinforced internally by a narrow zone of secondary tissue. The tabulæ are generally complete, horizontal, and lie about 1 mm. apart. There are no dissepiments.

Distribution.—Silurian. Gotland.

Remarks.—*T. rugosum* has a narrower zone of secondary tissue on the inner side of the epitheca than has *T. flexuosum*, which it closely resembles. The latter, moreover, has not the radiciform outgrowths characteristic of *T. rugosum*. The other specimen, however, figured by Edwards and Haime as *Eridophyllum? rugosum* (pl. x. figs. 4, 4 *a*), also has radiciform outgrowths, though fewer, but on the evidence of the figure is clearly a different species, since the septa are so long that they nearly reach the axis. Probably it belongs to one of the genera described in the next paper (see p. 309).

III.

The Genus Eridophyllum, *Edwards & Haime.*

Synonymy.—

Eridophyllum, Edwards & Haime, 1850, Mon. British Fossil Corals, p. lxxi.

Craspedophyllum, Dybowski, 1873, Monogr. Zoanth. scler. rugosa, pp. 83, 154, pre-print of Archiv Naturkunde Liv-Ehst- und Kurlands. ser. i. vol. v. pp. 339, 410; and 1873, Verhand. Russ.-Kaiserl. Min. Gesellschaft, ser. 2, vol. viii. p. 160. Genotype *C. americanum*, Dybowski, 1873, *op. primo cit.* p. 154, pl. i. figs. 2–6; 1873, *op. secundo cit.* p. 155, pl. vi. figs. 1–6: Devonian; Columbus, Ohio. =*Heliophyllum colligatum*, Billings, 1859, Canadian Journal, new ser. vol. iv. p. 126: Devonian; Ramas Farm, Port Colborne, Ontario. (For good figure, see Lambe, 1901, Geol. Surv. Canada; Contr. Canadian Geology, vol. iv. part 2, p. 155, pl. xiii. figs. 2, 2 *a*, 2 *b*.)

Crepidophyllum, Nicholson & Thomson, 1878, Proc. Roy. Soc. Edinburgh for 1875–6, p. 149. Genosyntypes *Diphyphyllum archiaci*, Billings, and *Heliophyllum sub-cæspitosum*, Nicholson, 1874, Geol. Mag. p. 58, pl. iv. fig. 9 (partim). Genolectotype *Diphyphyllum archiaci*, Billings, 1860, Canadian Journal, new ser. vol. v. p. 260, fig. 8 on p. 260: Devonian, Hamilton Shales; Bosanquet, Ontario; selected by Lambe, 1901, Geol. Surv. Canada; Contr. Canadian Geology, vol. iv. part 2, p. 154, pl. xiii. figs. 1, 1 *a*.

Diagnosis.—Compound Rugose Corals, typically phaceloid, in which the tabulæ are divided by an axial tube into an inner and outer series. The major septa reach the axial tube; the septa are typically carinate; and the dissepiments small and numerous.

Genotype.—*E. seriale*, Edwards & Haime, 1850, Mon. Brit. Fossil Corals, p. lxxi. Renamed, and generally, though wrongly, known as *E. verneuilanum*, Edwards & Haime, 1851, Pol. Foss. Ter. Pal. p. 424, pl. viii. fig. 6. Devonian. Columbus, Ohio.

Remarks.—*E. seriale* is phaceloid, with the corallites about 10 mm. in diameter, flexuous, widely separate, but occasionally united with neighbouring corallites by large lateral outgrowths of extrathecal tissue. Though not mentioned by Edwards and Haime, and probably overlooked by them, yet carinæ are present in the specimens which we have examined.

In *Eridophyllum colligatum* the corallites, though cylindrical for most of their length, yet frequently are expanded by an increase of the extrathecal tissue. These expansions, unlike the outgrowths of *E. seriale*, occur at the same levels as the dilatations of neighbouring corallites, and, meeting them, form successive platforms throughout the corallum. At these levels the corallites do not merely touch, but are prismatic, presenting polygonal transverse sections. The corallum is thus periodically cerioid.

In *Eridophyllum archiaci* the phaceloid corallites are hardly separated or actually touch, and have neither the radiciform outgrowths of *E. seriale* nor the simultaneous dilatations of *E. colligatum*.

EXPLANATION OF PLATE VI.

Figs. 1–7. *Tryplasma rugosum* (Edwards & Haime). Lectotype. In the Ecole Nationale Supérieur des Mines, Paris.
Fig. 1. External view, nat. size.
Figs. 2–4. Transverse sections, × 2·5. In the lowest corallite of fig. 2 the section passes through a lateral outgrowth.
Fig. 5. Longitudinal section, × 2·5.
Fig. 6. Diagram of transverse section, × about 16.
Fig. 7. Diagram of longitudinal section, × about 10.
Figs. 8, 9. *Eridophyllum seriale*, Edwards & Haime.
Fig. 8. Diagram of transverse section, × about 6.
Fig. 9. Diagram of longitudinal section, × about 5.

XLIV.—Ptilophyllum *and* Rhysodes, *gen. nov.* By STANLEY SMITH, M.A., D.Sc., and REGINALD TREMBERTH, B.Sc.

[Plate VII.]

AMONG the Silurian corals from Gotland in the British Museum Collection are two phaceloid species with small corallites, and bearing externally a strong resemblance to the figure of *Eridophyllum? rugosum*, Edwards & Haime, 1851, pl. x. figs. 4, 4*a* (not 4*b*) *. One has dissepiments, and the other no dissepiments, but a stereozone. In the absence of the specimen figured by Edwards and Haime, as 4, 4*a*, and presumably lost, it is impossible to say whether either of the Gotland forms mentioned is specifically identical with Edwards and Haime's specimen, though both Edwards and Haime's figure and their description suggest the coral with dissepiments. In any case, it is desirable to name and describe both of the Gotland forms mentioned, and, since they differ both in their internal structure and manner of budding, we place them in separate genera.

For the form with dissepiments we propose the name *Ptilophyllum* and for the other *Rhysodes*.

It appears that no species described by Lindström belonged to either genus; yet Lindström recorded "*Diphyphyllum rugosum*, E. & H." as no. 52 on p. 22 of his 'List of the Fossil Faunas of Sweden.—II. Upper Silurian,' and he presented to the British Museum a specimen (48293) labelled "*Eridophyllum rugosum*."

We thank Dr. F. A. Bather, the Keeper of the Department of Geology, British Museum, for the use of the specimens, and Dr. W. D. Lang for the help he has given us.

PTILOPHYLLUM, gen. nov.†

Diagnosis—Compound Rugose Corals of phaceloid or dendroid habit, with dissepiments, carinate septa, a large extent of axial anastomosing tissue, and tabulæ which slope downwards and towards the axis.

Genotype.—*Ptilophyllum lindstromi*, sp. n.

---

* The lectotype of *Eridophyllum? rugosum*, Edwards & Haime, is the specimen figured as 4*b*, and should be called *Tryplasma rugosum* (Edwards & Haime), see previous paper, p. 305.

† πτίλον, a feather, and φύλλον, a leaf—*i. e.*, a septum.

Ptilophyllum lindstromi, sp. n.

(?) 1851. *Eridophyllum? rugosum* [sic], partim, Edwards & Haime, Pol. Foss. des Terr. Palæoz. p. 425, pl. x. figs. 4, 4 *a* (non 4 *b*).

(?) 1888. *Diphyphyllum rugosum*, Edwards & Haime; Lindström, List of Fossil Faunas of Sweden: II. Upper Silurian, p. 22, no. 52.

Non *Eridophyllum? rugosum*, Edwards & Haime, 1851, *op. cit.* p. 425, pl. x. fig. 4 *b*. This is *Tryplasma rugosum.*

Diagnosis.—As for the genus.

Description.—*External Characters.* The corallum is phaceloid, and the corallites are cylindrical, tall, very slender, and free, but may be conjoined at frequent intervals by lateral outgrowths, as in Edwards and Haime's figures of *Eridophyllum? rugosum.* Transverse annulation is very pronounced, and produces sharp projecting ledges. Longitudinal striation is less prominent. The calices are only moderately deep, have a stout wall, and often a broad flattened margin. Gemmation is marginal and non-parricidal—that is, only one or two buds are produced at a time, and these develop without hurt to the parent.

Internal Characters. The major and minor septa (about fifteen of each) are nearly equal in length, and the former reach, or almost reach, the centre of the corallite; the axial ends of both major and minor septa, together with the innermost tabulæ, form an axial structure, which is reinforced by the carinæ on the septa and by a certain amount of secondary tissue (Pl. VII. figs. 1, 4, 6). The tabulæ are small, strongly arched, distally convex, dissepiment-like plates, which slope downwards and towards the axis (Pl. VII. figs. 2, 7). The dissepiments are relatively large, and form a comparatively wide peripheral zone.

Strong carinæ are developed on the sides of the septa and secondary tissue is deposited at the axial and peripheral regions of the corallite, but in varying degrees.

Holotype.—British Museum specimen R. 24356; Silurian, horizon *f* (=Ludlow); Östergarn near Montellius's house. Collected by Dr. F. A. Bather.

Remarks.—Edwards and Haime's figs. 4, 4 *a* are more like B.M. specimen 48293 and R. 1686 than the holotype. This was selected for its good preservation and because its horizon and locality are precisely known, which is not so in the case of the other two specimens.

The corallites of the holotype are well separated, are 5–6 mm. in diameter, and have 30 to 34 septa. There is much secondary tissue present in both the axial and peripheral areas, but more particularly in the earlier growth-stages (Pl. VII. fig. 5). The calices are well preserved (Pl. VII. fig. 3), but the corallites are embedded in matrix, and it is not possible to say whether or not the lateral outgrowths which are present in specimens 48293 and R. 1686 are strongly developed or not *.

Both 48293 (presented to the Museum by Prof. Lindström in 1867, and merely labelled as from "Wenlock Series, Gotland") and R. 1686 (Lee Collection, simply stated to be from the Upper Silurian, Gotland) agree very closely with Edwards & Haime's figs. 4 and 4*a*. The corallites are long, straight, closely-packed, and united to each by their lateral outgrowths. They are 4–5 mm. in diameter and have about twenty-six septa. The median area is more clearly marked off from the axial and peripheral areas than in the holotype R. 24356; there is a smaller amount of secondary tissue present, and the dissepiments are larger and flatter.

Carinæ are strongly developed in all three specimens.

In the Hisinger collection, kindly lent us for study by Prof. Stensio of Stockholm, there are several specimens from Gotland of this coral under the numbers 244 and 249, labelled "*Caryophyllia truncata.*"

RHYSODES, gen. nov. †.

Diagnosis.—Compound Rugose Corals of phaceloid habit, in which the septa are united peripherally, and again axially, by secondary thickening. The tabulæ slope downwards and away from the axis.

Genotype.—*Rhysodes samsugnensis*, sp. n.

Rhysodes samsugnensis, sp. n.

For possible synonymy, see under *Ptilophyllum lindstromi.*

Diagnosis.—As for the genus.

Description.—*External Characters.* This species externally resembles *Ptilophyllum lindstromi*, except in its calices and in its manner of reproduction. The calice has a sharp edge and is deep, and there is a slight boss in the centre (Pl. VII. fig. 9). Gemmation is proliferous and parricidal, and a complete ring of small contiguous buds is almost invariably formed. As many as nine of these have been observed fringing the parent calice.

---

* This is not a very important character, to judge from the instance of *Xylodes articulatus*, in a single colony of which some corallites are, while others are not, thus united.

† *ῥυσώδης*, wrinkled, gnarled.

Internal Characters. The major septa reach the centre of the corallite, but the minor extend inwards only half, or less than half, that distance (Pl. VII. figs. 8 *a*, 8 *b*). Axially, and again peripherally, secondary tissue is deposited between the septa, forming a solid extrathecal area or stereozone.

The tabulæ, as seen in longitudinal section (Pl. VII. fig. 10), are curved plates, distally concave and sloping downwards and towards the periphery. Most of them extend from the axis to the stereozone, and may even enter the dense tissue, although some end against the tabulæ distal to them. The tabulæ thus appear in section as two series of superposed cones, one on each side of the axis, and dissected by the septa *.

There are no dissepiments, nor have we observed any traces of carinæ in the specimens examined.

Holotype.—British Museum specimen R. 24355 ; Silurian, horizon *f* (=Ludlow) ; Samsugn in Othem, Gotland. Collected by Dr. F. A. Bather.

Remarks.—The holotype has slender cylindrical corallites, 4–5 mm. in diameter and having 18–20 major septa. The minor septa are very short, few of them extending beyond the stereozone. The solid axis and stereozone are both well developed.

In specimen R. 24361, collected by Dr. F. A. Bather from the same horizon and locality as R. 24355, the corallites are more turbinate and attain a much greater diameter, and the minor septa are much longer than in the holotype. The largest corallite measures 9 mm. in diameter and has twenty-two major septa.

Specimen R. 24351, horizon *f* (= Ludlow), Fårösund, quarry near windmill, collected by Dr. F. A. Bather, has slender cylindrical corallites of the same diameter (4·5 mm.) and with the same number of septa (about eighteen) as the holotype, but the axis is less solid, the stereozone is narrower, and the minor septa even shorter. The ephebic stage has advanced but little beyond the neanic.

---

* The segment into which the septa cut the tabulæ are not necessarily on quite the same level; hence in a tangential longitudinal section the tabulæ may appear somewhat dislocated. See note and diagram in the Q. J. G. S. for 1916, p. 226.

EXPLANATION OF PLATE VII.

Figs. 1–7. *Ptilophyllum lindstromi*, sp. n.
Figs. 1–5. Holotype, British Museum specimen R. 24356; Silurian. Horizon *f* (=Ludlow); near Montelius' house, Östergarn, Gotland. Collected and presented by Dr. F. A. Bather.
Fig. 1. Transverse section, × 3. Photograph.
Fig. 2. Longitudinal section, × 3. Photograph.
Fig. 3. Calices, × 2·5. Photograph.
Fig. 4. Transverse section, ephebic stage, × 3. Drawing.
Fig. 5. Transverse sections hystero-brephic and -neanic stages, × 3. Drawing.
Figs. 6–7. British Museum specimen 48293, Silurian, Gothland. Presented by Prof. G. Lindström.
Fig. 6. Transverse section, × 3. Drawing.
Fig. 7. Longitudinal section, × 3. Photograph.
Figs. 8–11. *Rhysodes samsugnensis*, sp. n.
Figs. 8–9. British Museum specimen R. 24361; Silurian, horizon *f* (= Ludlow); Samsugn in Othem, Gothland. Collected and presented by Dr. F. A. Bather.
Fig. 8 *a*. Transverse section, × 2·5. Photograph.
Fig. 8 *b*. ——— ———, × nearly 3. Drawing.
Fig. 9. Calice, × 2·5. Photograph.
Fig. 10. Holotype, British Museum specimen R. 24355; Silurian, horizon *f* (= Ludlow); Samsugn in Othem, Gothland. Collected and presented by Dr. F. A. Bather. Longitudinal section, × 2. Drawing.
Fig. 11. Transverse sections illustrating gemmation and the hystero-brephic stage, × 2. Drawings.
Fig. 11 *a*. British Museum specimen R. 24351, Fårösund, Gothland.
Fig. 11 *b*. British Museum specimen R. 24355 (Holotype).

XLV.—*Notes on a small Collection of Mysidacea from West Africa.* By W. M. TATTERSALL, D.Sc., University College, Cardiff.

THROUGH the courtesy of Dr. R. Ph. Dollfus and Dr. Th. Monod, I have been permitted to examine a small collection of Mysidæ from three parts of the West African Coast—Morocco, the Western Sahara (French West Africa), and the Cameroons. This region of the Atlantic shores is practically unexplored as far as this group of Crustacea is concerned, the only species hitherto recorded from there being *Rhopalophthalmus flagellipes*, Illig, taken by the 'Valdivia' at the mouth of the Congo. The records, therefore, are of special interest as filling in a gap in our knowledge of the occurrence and distribution of species of this group, and seem, from this point of view, to be worthy of publication. The collection included ten species, all known forms, of which two are of more than usual interest, *Rhopalophthalmus flagellipes* and *Synmysis parkeri*. The former has not been recorded again since its original discovery more than twenty years ago, and the latter has so far only been recorded from the Devonshire Coast of England. The one rather striking fact, which emerges from a study of the collection as a whole, is its strong British facies. All the Moroccan species, nine in number, occur also on the South Coast of England. Three of them extend as far as the Cameroons and five into the Mediterranean. The one species peculiar to the West Coast of Africa is *R. flagellipes*. The Mysidacean fauna of the littoral waters of the Eastern Atlantic, from England to Morocco at least, appears to be singularly uniform.

In order to save repetition a list of the localities is given here, and reference to them in the text will be by Roman numerals only:—

MOROCCO. Collected by Dr. R. Ph. Dollfus and Dr. Jacques Liouville.

I. Casablanca Harbour, 4. vi. 1924, 8.30–9.30 P.M., plankton at light.
II. Casablanca Harbour, 6. vi. 1924, 9–10.30 P.M., plankton at light.
III. Mazagan Harbour, 25. vi. 1924, 9–10 P.M., plankton at light.
IV. Station L, "Vanneau," N. 33° 35′ 45″, W. 7° 45′ 6″, 19. vi. 1924, plankton.
V. Station LVI., "Vanneau," N. 33° 30′ 20″, W. 8° 24′ 30″, 24. vi. 1924, plankton.

FRENCH WEST AFRICA. Collected by Dr. Th. Monod.

VI. Pointe du Répos, Lévrier Bay, C. Blanco, 18. xii. 1922.
VII. Grève du fortin d'Irrelisli, près Agadir, 23. viii. 1925.

CAMEROONS. Collected by Dr. Th. Monod.

VIII. Souelaba, plankton.
IX. Grand Batanga.

The following is a list of species in the collection:—

Siriella armata (M.-Edw.).

Localities.—I. and II. Three immature females, 9–10 mm.

In the absence of full-grown adult males these specimens appear to belong to this species. The antennal scale is shaped more nearly as in *S. armata* than in *S. frontalis*, and the thoracic limbs are not so robust as in the latter species.

Siriella jaltensis, Czerniavsky.

Localities.—I., II., and III. Numerous specimens up to 10 mm.

Rhopalophthalmus flagellipes, Illig.

Localities.—VIII. Two females, 7–10 mm., many immature specimens, 4–6 mm.; IX. Two mature males, 15 mm. Numerous specimens were also found in the stomach of *Elops lacerta* caught at Souelaba.

The types and only known specimens of this species were taken by the 'Valdivia' off the mouth of the Congo. It is very nearly allied to *R. egregius*, Hansen, and I have found the closest resemblance in the appendages of the two species. The only marked difference between the two is in the proportions of the eye, and this difference is actually less than would appear from Illig's figure (Zool. Anz. Bd. xxx. p. 207, fig. 15). Illig's largest specimen measured 7 mm., while the adult male in this collection is 15 mm. long. The proportions of the eye appear to alter slightly with age, and the eye in the young looks longer and more slender than in the adult. The differences between the eye in the two species are best expressed in the following measurements:—

	R. egregius. (Hansen's figure.)	*R. flagellipes.* (Male, 15 mm.)
Total length of eye and stalk	1·00	1·00
,, ,, stalk	·64	·70
Breadth at base of cornea	·60	·51

In Illig's figure the proportions are 1·00, ·80, and ·30 respectively. The difference amounts to the fact that the eye in *R. flagellipes* is about twice as long as broad and the stalk nearly once and a half as long as broad, while in *R. egregius* the whole eye is little more than once and a half as long as broad, and the stalk just slightly longer than broad. The slenderness of the eye is exaggerated in Illig's figure. The thoracic limbs have from seven to nine articulations in the sixth joint.

Gastrosaccus spinifer (Goës).

Localities.—I. and II. Numerous adults of both sexes, 8–10 mm.; VI. One male, 7 mm.; VIII. Two males and two females, 5–7 mm.

Except for their smaller size, I can see no difference between these specimens and northern examples of this species.

Gastrosaccus sanctus (van Ben.).

Localities.—II. Two males, 6–8 mm.; VIII. One immature specimen, 3 mm.

Gastrosaccus normani, G. O. Sars.

Locality.—V. One male, 9 mm.

This specimen agrees with those which I recorded from the Bay of Biscay (Journ. Mar. Biol. Assoc. vol. viii. 1908, p. 192) in possessing two dorsal, forwardly-directed lobes on the carapace. In this character they differ from Mediterranean examples, but a series of specimens from both the Atlantic and the Mediterranean is desirable before the value of this difference can be estimated. In other respects I can find no difference between these specimens and typical *G. normani*.

Mesopodopsis slabberi (van Ben.).

Localities.—III. One immature specimen, 5 mm.; VIII. Two adult males, 9 mm.

This species has already been recorded from S.W. Africa by Zimmer. Its occurrence, therefore, at points intermediate between Zimmer's localities and the northern area of its distribution on the Mediterranean and Atlantic coasts of Europe was to be expected.

Schistomysis ornata (G. O. Sars).

Locality.—IV. One female, 10 mm.

In the absence of thoracic limbs, this specimen appears to agree fairly closely with northern specimens of this species.

Synmysis spiritus (Norman)?

Locality.—II. One immature specimen, 7 mm.

It is impossible to be sure of the identity of this specimen. In most of its characters it agrees with this species, but the spines on the inner uropod are not nearly so crowded as in mature specimens of *S. spiritus*. This may be due to the small size and immaturity of the specimen.

Synmysis parkeri (Norman).

Locality.—VII. One male and one female, 8 mm.

These specimens are damaged, and neither has retained any of the thoracic limbs. In spite of this, however, it is possible to identify them with a tolerable amount of certainty. In the character of the curved inner uropod, with its peculiarly arranged armature of long spines, the form of the antennal scale and telson, and in the structure of the fourth pleopod of the male, the specimens are in the closest agreement with Norman's description of *S. parkeri*, and I have no hesitation in ascribing them to that species. The record is of special interest, for hitherto *S. parkeri* has not been found anywhere else but on the south coasts of Devonshire in England.

BIBLIOGRAPHICAL NOTICE.

A Handbook of the Birds of Eastern China. By J. D. D. La Touche, C.M.Z.S., C.F.A.O.U., M.B.O.U., etc. Part IV. Pp. 105. London: Taylor & Francis, 1927. Price 7*s.* 6*d.*

The present part of Mr. La Touche's excellent work on the Birds of Eastern China contains the remaining families of the Passeres—*i. e.*, the Ploceidæ, Fringillidæ, Bombycillidæ, and Hirundinidæ. In the Ploceidæ we notice that Mr. La Touche considers the Formosan form of *Uroloncha punctulata* to be the Chinese *U. p. topela*, and not Stuart Baker's *U. p. subsquamicollis*, but the series in the British Museum seem to be nearer this latter form. We also notice with regret that in regard to these little birds the author gives full descriptions of each race, instead of short descriptions showing how they differ from their nearest relations. Written descriptions of subspecies convey but little to the reader, and often they apply equally well to any one of two or more races. La Touche has hitherto described but one subspecies in full, and then merely drawn attention to the details in which the other races differ. This is the only scientific way of describing races, and we hope he will adhere to it. Eastern China is exceptionally rich in finches and buntings, and no fewer than fifty-six of these are described, the latter numbering thirty. Mr. La Touche's field-notes on these birds, many of them from personal observation, are most interesting and very valuable, and his notes on distribution should be carefully studied.

Of the swallows, the author accepts three races of *Hirundo daurica* as occurring within the area dealt with by him. *H. d. daurica* is a winter migrant only, *H. d. striolata* a resident in *Formosa*, whilst *H. d. nepalensis* is said to be the common breeding form in Eastern China. Possibly the author is more nearly right than Stuart Baker and previous writers, but the division of *H. daurica* into races is very difficult, and really should not be attempted except on good series of breeding birds—a fact which is gradually becoming accepted in regard to most species which are distributed over a great breeding area and, in addition, wander into other countries in the non-breeding months.

We congratulate the author on the fourth part of his work, which is fully up to the standard of those preceding it, not only in scientific value but also in general interest.

PROCEEDINGS OF LEARNED SOCIETIES.

GEOLOGICAL SOCIETY.

February 2nd, 1927.—Sir Arthur Smith Woodward, LL.D., F.R.S., Vice-President, in the Chair.

The following communication was read :—

'Tertiary Foraminifera from the Naparima District of Trinidad (British West Indies).' By Winfred Laurence Falkiner Nuttall, D.F.C., M.A., Ph.D., F.G.S.

The rocks of the Naparima district consist of an upper and a lower series, which rest upon one another unconformably. Foraminifera are abundant in these beds, and indicate that the upper series is of Miocene-Oligocene age and the lower series Upper Eocene. There are two distinct areas separated by a zone of overthrust faulting. The stratigraphical sequence and foraminiferal faunas of these areas are dissimilar, and the explanation offered is that they were originally two separated basins of deposition. In the 1270 prepared samples that were examined, 145 species and varieties of Foraminifera were identified, 13 of which are new. Certain species are much commoner at one horizon than at another, and these may be used to recognize the major stratigraphical subdivisions. In addition, a few species are restricted in their vertical distribution, so as to be found only in the Eocene strata.

February 23rd, 1927.—Dr. F. A. Bather, M.A., F.R.S., President, in the Chair.

The following communication was read :—

'A Critical Revision of the Rugose Corals described by W. Lonsdale in Murchison's "Silurian System".' By William Dickson Lang, M.A., Sc.D., F.G.S., and Stanley Smith, M.A., D.Sc., F.G.S.

The Corals and Polyzoa described and figured by W. Lonsdale in Murchison's 'Silurian System' are important, not only for including the genotypes of several genera and the holotypes of a number of species, but also for being some of the earliest-described British Silurian forms. It is clear, then, that a detailed knowledge of both the external characters and the internal structure of Lonsdale's specimens is desirable, especially in view of their misinterpretation by subsequent authors, who have identified some of them with species to which they are not even closely related. Lonsdale, too, has wrongly referred some of his specimens to species already described by former authors. Consequently, the nomenclature of British Silurian Corals is confused; and it is the object of this paper to unravel the tangles so far as the Rugose Corals are concerned, and to put the nomenclature upon a sound footing. Lonsdale's names for these corals are as follows:—*Astrea ananas* de Blainville; *Caryophyllia flexuosa* Lamarck; *Acervularia baltica* Schweigger; *Cyathophyllum turbinatum* Goldfuss; *C. angustum* sp. nov.; *C. cæspitosum* Goldfuss: *C. dianthus* Goldfuss: *Cystiphyllum siluriense* Lons.; *C. cylindricum* sp. nov.; *Strombodes plicatum* Ehrenberg; *Turbinolopsis bina* sp. nov.; *T.* sp.; *Cyclolites lenticulata* Lons.; *C. præacuta* Lons.

It is fortunate that, although some are lost, many of Lonsdale's specimens still exist, and are now in the Museum of Practical Geology, London. The Authors are indebted to Dr. F. L. Kitchin for kindly allowing them to borrow the specimens. Besides Lonsdale's types, certain other Rugose Corals, described by F. M'Coy and by A. M. Edwards & J. Haime, have been examined and are described in this paper. They are allied to those described by Lonsdale, and are involved in discussing these. The types are in the Sedgwick Museum, Cambridge, and were kindly lent to the Authors by Prof. J. E. Marr for examination. They were originally described under the following names:—*Arachnophyllum typhus* M'Coy; *Strephodes trochiformis* M'Coy; *Cystiphyllum brevilamellatum* M'Coy; and *C. grayi* Edwards & Haime.

During the work, several difficult points in nomenclature have inevitably arisen, especially with regard to the selection of genolectotypes. It is hoped that these difficulties, when presented will evoke discussion.

April 6th, 1927.—Dr. F. A. Bather, M.A., F.R.S., President, in the Chair.

The following communication was read:—

'The Occurrence, Morphology, and Affinities of the Silurian Echinoidea *Echinocystis* and *Palæodiscus*.' By Prof. Herbert Leader Hawkins, D.Sc., F.G.S., and Miss S. M. Hampton, B.Sc.

Church Hill Quarry, near Leintwardine, has a reputation that seems out of proportion to its size. The flaggy mudstones (of Lower Ludlow age) have yielded a noteworthy assemblage of types not known elsewhere. This is especially true of the Echinoderma. Curious forms, such as *Palæodiscus*, are found there only; and Stelleroids of the genera *Lapworthura*, *Furcaster*, and *Sturtzaster* (together with several Crinoids) often occur in matted seams.

With support from the British Association Committee for Excavation of Sections in Palæozoic Rocks, the long-abandoned quarry was re-opened, and a careful record of the sediments was made, with intent to ascertain the conditions of their formation. A column of rock was excavated to a depth of 12 feet 6 inches from the surface. The beds traversed are all calcareous flaggy mudstones, varying slightly in lime-content. Ripple-marked surfaces were found at two horizons. Many bedding-planes are crowded with *Monograptus leintwardinensis*; others are covered with small *Leptæna rhomboidalis*; but fossils are very rare, except in such congested bands. Two 'starfish-beds' were cut through—the upper containing *Furcaster*, *Echinocystis*, and *Palæodiscus*, and the lower (5 feet below) made up of *Lapworthura* and Crinoids. From the combined evidence of the sediments and the distribution of the fossils, it is deduced that the series accumulated in shallow lagoon-water, and that the indigenous fauna of Echinoderms and *Lingulæ* was periodically reinforced by brachiopods, pteropods, and graptolites drifted in during storms.

New material of *Echinocystis* and *Palæodiscus*, including specimens which show obverse and reverse casts, and others showing upper and under surfaces of the test, has made it possible to solve many of the problems associated with the genera. They have been placed in a special order of Echinoidea (sometimes of Cystidea) in the belief that they show affinities with Cystids (particularly Edrioasteroids) and Stelleroids as well as with Echinoids. It has been claimed that they are acyclic or exocyclic, and that their ambulacra include relics of 'Asteroid' ossicles under the 'Echinoid' plates. Re-examination of the original material in the light of the new specimens seems conclusively to disprove both claims.

Echinocystis is revealed as a typical Perischoechinoid, with a normal endocyclic apical system and an advanced complexity of ambulacral structure. It is very nearly allied to the Lepidocentridæ, but is provisionally kept as the type of a separate family. '*Palechinus*' *phillipsiæ* from the Valentian is believed to be an *Echinocystis*, and possibly '*Eocidaris*' *acuaria* from the Upper Devonian should be included in the genus or family.

Palæodiscus is redescribed from a large suite of new specimens which collectively show it in almost every aspect. The indications of an endocyclic apical system seem convincing. The reputed 'Asteroid' ambulacral plates are shown to be knob-like ingrowths from the perradial zones of the otherwise normal plates, and their relation to the mechanics of flexibility are discussed. Similar structures occur in *Hyattechinus*, a form closely akin (morphologically) to *Palæodiscus*. This genus is referred to the Lepidocentridae.

Both genera are claimed as advanced Perischoechinoids—far too specialized to show pre-Echinoid features. The order Echinocystoidea (with various pseudonyms) must be abandoned; and hypotheses on Echinoid phylogeny that are based on misconception of these two genera are unsubstantial.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[NINTH SERIES.]

No. 118. OCTOBER 1927.

XLVI.—*Descriptions of new Species of Heterocera from Africa and the East.* By G. T. BETHUNE-BAKER, F.L.S., F.Z.S.

IN describing the following new species I have to thank Mr. Tams, of the British Museum (Natural History), for very much ungrudging assistance in the determination of many species.

Syntomidæ.

Paramelisa bitjeana, sp. n.

♂. Head, face, and thorax brown; abdomen brown, with third segment whitish and some yellow hairs at the base, ventral surface whitish.

♀. Upperside: both wings lustrous deep bronzy purple, this colour extending to a slight extent to the head and thorax; otherwise like the male.

In both sexes the segmental divisions of the abdomen are finely ochreous, and there is a fine ochreous line across the centre of each segment.

Expanse, ♂ 43, ♀ 47 mm.

Hab. Bitje, Cameroons, 2000 ft. (*G. L. Bates*).

Types in my collection.

It should be noted that the neuration of the sexes differs in this genus; in my male vein 2 descends nearly vertically to the inner margin just in front of the tornus, which seems to be more definite in this species than in either *P. lophura* or *lophuroides*; in the female this vein goes to the termen just above the tornus, which is excavated to meet it, thus making the tornus into a definitely toothed angle; again, the base of the inner margin is not lobed at all in the female as it is in the male. In the secondaries there is no abortion of the wings, as is so marked a feature of the male sex; the wing is reduced in size, as is the case with other Amatidæ, but that is all.

I have been unable to trace any record of females of this genus having been received before.

Balacra jaënsis, sp. n.

♀. Head, collar, and face white, thorax and patagia pale buff; abdomen and dorsum pale ochreous, with a white central stripe, pectus entirely white, including the lateral portions; alongside the central dorsal stripe on each side is a row of dark dashes or spots, probably on each of the first six segments. Primaries very pale ochreous, with the neuration prominently darkish brown, and a brownish subapical cloud, and a darker cloud below the basal part of vein 2 extending well on to the inner margin. Secondaries white, subhyaline.

Expanse 57 mm.

Hab. Bitje, Cameroons, 2000 ft. (*G. L. Bates*).

Type in my collection.

This species should come next to *B. rubrostriata*, Aur., but, among minor differences, it can be separated at once from it by the complete absence of any red marks on the abdomen.

METARCTIA.

When Sir George Hampson was preparing to issue his 'Supplement' (1914), as usual he had all my types for examination, and he sank several of them as synonyms to older species; he was aware that I differed from him decidedly in some cases. I have now had the opportunity of examining them again with Mr. Tams, and comparing them again with the material in the British Museum, and we have jointly come to the following conclusions:—

"*Metarctia invaria*, Wlk.

"Insert as syn. *Metarctia rosacea*, B.-B."

We are agreed that this is correct; my specimens are a pale rosy form, but the species is so variable that the name should be sunk.

Metarctia erlangeri, Roths.

Metarctia diversa, B.-B.

The type in the Tring Museum is a female, my type is a male and has certain decided differences in colour, but it is probably the same species, and had better stand as such until we get much more material.

Metarctia contrasta, B.-B.

Sir George has sunk this ('Supplement,' i. p. 70) under *flavicincta*, Aur., but we are agreed that this cannot be accepted; the antennæ are very different, the collar differs, and altogether it is evidently another species.

Metarctia uniformis, B.-B.

Sir George has sunk this (*l. c.*) also under the same species, but we consider that IF (with emphasis) it should prove to be the same species, it is certainly a thoroughly good local race.

Metarctia pallens, B.-B.

Sir George (*l. c.* p. 72) sinks this under his *fulvia*, but both Mr. Tams and I think he is in error in so doing; the antennæ are different as well as colour and markings, and the conclusion we came to was that it had nothing to do with Sir George's insect.

Agaristidæ.

Tuerta costistrigata, sp. n.

♂. Both wings black, with broad white median areas. Primaries with three indistinct stripes of scattered blue scales in the basal area, followed by a broad oblique white stripe from the costa to the inner margin; costa with a subcostal stripe of differently placed scales from the inner edge of the white stripe almost into the subapical area; this stripe is white in the white area but neutral grey in the black area; the neuration beyond the white area is finely marked out with bluish scales. Secondaries with the basal black extremely restricted, followed by a very broad white area, the outer margin being very broadly deep black.

Head and face dark crimson-red tinged with chestnut-colour; thorax black; abdomen with a central stripe of deep bronzy chestnut-red, extending laterally towards the anal extremity. Legs with the femora with long deep red fringes.

Expanse 48 mm.

Hab. Bitje, Cameroons, 2000 ft. (*G. L. Bates*).

Type in my collection, 2 ♂ ♂.

This species should be placed near *T. memnonia*, Karsch.

Noctuidæ.

Egybolis vaillantina, Stoll, *cameroona*, subsp. n.

Differs from the type in the uniform colour of both wings, there being no dark broken posterior stripe, beyond which the tone of the ground-colour is paler; at the base of the primaries there is a pale ochreous costal and a rather larger similar inner marginal spot with a slight blackish border, there being no broad deep orange basal band as in the type; the costal spot above the end of the cell is pale ochreous, larger than in the type and crescentic, that closing the cell is decidedly narrower and pale ochreous; a small pale ochreous dot beyond the cell.

The insect is of about the same size as the type-form.

Hab. Genderu, Cameroons, 1800 ft., August (*G. L. Bates*).

Type in my collection, four specimens.

Giaura obalauæ, sp. n.

♂. Head and thorax pale ashen grey, abdomen darker. Primaries pale ashen grey, with darker brown base, with a narrow darker external line; this is followed by a broad pale area, widest in the inner marginal area; a very broad, slightly darker postmedian area all across the wing, which is bounded externally by a white line; a dark subterminal line. Secondaries pale grey, with much very fine brownish irroration.

Expanse 20 mm.

Hab. Obalau Island, Fiji (*R. Baxandale*).

Type in my collection.

This species is probably nearest to *G. minor*, Hmpsn.

Lymantriidæ.

Leucoma nigrolineata, sp. n.

♂. Head, frons yellowish, vertex white, palpi white tipped with black; antennæ with black shaft and long grey ciliations, thorax white, patagia yellowish, abdomen whitish, terminally yellowish, legs whitish with black tarsi.

Both wings pure white. Primaries with a waved black line in the fold from the base to the termen; veins 4, 6, 7, and the short branch of 8 outlined with black, costa black. Secondaries with a very short dark dash at the end of veins 4 and 7, and a black dot at the end of 6, the fringe just above the apex blackish for a short space.

Expanse 57 mm.

Hab. Bitje, Cameroons, 2000 ft. (*G. L. Bates*).

Type in my collection.

It was extremely difficult to place this insect at all at the British Museum, but it suits this section best, and therefore I have placed it in this genus; there is nothing at all like it in the collection.

Aroa yokoæ, sp. n.

♂. Head, thorax, abdomen, and both wings pale creamy yellow; both the wings have the termen edged very broadly —more than half the distance towards the cell—with blackish brown. Underside like the upperside.

Expanse 26 mm.

Hab. Yoko, Cameroons, 2000 ft., July (*G. L. Bates*).

Type in my collection, 4 ♂ ♂.

I have placed this in the genus *Aroa*; this large genus contains many species that look very different and not nearly related to each other; it evidently wants thorough revision. The species here described is not nearly connected with any that I am acquainted with.

Monda afra, sp. n.

♂. Primaries with all the wing above vein 2 black, the terminal area being more greyish and extending into the termen, the rest of the wing subhyaline white. Secondaries subhyaline white, slightly greyish next the termen. Head, thorax, and antennæ dark greyish.

Expanse 32 mm.

Hab. Bitje, Cameroons, 2000 ft. (*G. L. Bates*).

Type in my collection.

This is near *M. heylaertii*.

Creaga batesi, sp. n.

♂. Head, thorax, and abdomen creamy grey. Both wings hyaline; primaries grey, in one or two specimens greyish white, with a dark spot in the angle of vein 2; secondaries white, immaculate.

Expanse 44 mm.

Hab. Bitje, Cameroons, 2000 ft. (*G. L. Bates*).

Type in my collection, 5 ♂♂.

Other specimens in the National Collection.

Eupterotidæ.

Dreata yokoana, sp. n.

♀. Frons dark sepia-brown, vertex greyish brown, collar sepia-brown, thorax brown, abdomen paler brown. Both wings brown, with a slight cinnamon tinge. Primaries with a median and a postmedian, dark brown, transverse narrow stripe, slightly concave and almost parallel to each other; no other marks except a trace of a clouding in the submarginal area. Secondaries paler than primaries, with a broad median and postmedian waved and irregular dark band right across the wing from the costa to the inner margin.

Expanse 118 mm.

Hab. Yoko to Tibate, Cameroons, 2000 ft., July (*G. L. Bates*).

Type in my collection.

This does not appear to be very close to any of its near species.

Apona ronaldi, sp. n.

♀. Head, thorax, abdomen, and both wings greyish brown. Primaries with a restricted basal area darker, ending obliquely and abruptly; a dark triangular spot at the end of the cell; a pair of fine, curved, parallel, dark median lines, which are carried through the hind wings; a pair of waved similar postmedian lines with pale interspace; from this point the veins are darkly outlined and there is a good deal of dark suffusion; if this specimen were very fresh, it looks as if this suffusion might extend to the termen. Secondaries with the double median line already referred to and a postmedian curved and waved dark line.

Expanse 90 mm.

Hab. Yunnan-fu neighbourhood (*Lankester*).

Types in my collection.

I name this species after my friend Ronald Lankester, who sent me the specimen among other things.

Euchera esomelana, sp. n.

♂. Head, face, and thorax dull ochreous, antennæ black, abdomen dull ochreous. Primaries, costa and outer half black, basal portion below costal vein white, all the wings somewhat hyaline. Secondaries white, with the outer margin black, invading the nervures and so scalloping the black margin.

♀. Both wings white, subhyaline, with outer margins black and scalloped along the veins ; a trace of an interrupted black transverse postmedian band in the primaries.

Expanse, ♂ 60–64, ♀ 58 mm.

Hab. Bitje, Cameroons, 2000 ft. (*G. L. Bates*).

Types in my collection, 3 ♂ ♂, 1 ♀.

Phasicnecus elgonæ, sp. n.

Head, thorax, and both wings pale golden ochreous; antennæ with shaft blackish and ciliations paler. Primaries with a broadish postmedian, concave, rusty transverse band, broadening as it approaches the inner margin near the tornus. Secondaries immaculate.

Expanse 54 mm.

Hab. Mount Elgon, Uganda Protectorate (*Ladbury*).

Type in my collection.

Phasicnecus novempunctatus, sp. n.

♂. Face brown ; head, thorax, and abdomen whitish ; antennæ with white shaft and grey ciliations. Both wings subhyaline white, with nine black spots on each side—five spots on the primaries and four on the secondaries, both in the postmedian areas. Primaries with two spots below the costa, the second much the larger ; two spots, one on each side of vein 3, the lower one much the larger, and one short dash on the inner margin ; above this there is a trace of a few black scales. Secondaries with one spot between veins 6 and 7, one spot on each side of vein 3, the lower being the larger, and one spot on the inner margin ; there is also the least trace of a series of submarginal points, but so faint as to be only discernible in a certain light.

Expanse 37 mm.

Hab. Bitje, Cameroons, 2000 ft. (*G. L. Bates*).

Type in my collection.

Notodontidæ.

Cerura cameroona, sp. n.

♀. Head, face, and collar white; prothorax black, then white; abdomen white. Both wings snow shining white, with a few black markings. Primaries, a trace of an oblique interrupted black dash in the fold; a trace of a median interrupted line, visible by a small black costal mark; a trace of another in the cell, and a fair-sized mark on the inner margin; a trace of two very short black costal dashes beyond the cell, followed by a black wedge-shaped costal mark; a bare trace of a black subterminal line, mainly noticeable by a fair-sized black mark on the inner margin almost in the tornus; fringe with defined black interneural spots. Secondaries and fringes uniformly white.

Expanse 60 mm.

Hab. Bitje, Cameroons, 2000 ft. (*G. L. Bates*).

Type in my collection, 2 ♀ ♀.

In one specimen (not the type) the interrupted median stripe is fairly distinct.

Scalmicauda biarculinea, sp. n.

♀. Head and thorax pinkish chestnut with some greyish scales, abdomen paler. Primaries pinkish tawny, becoming paler and pinker towards the termen; a trace of a fine excurved and recurved subbasal line; a pair of fine, curved, parallel dark lines from just in front of the apex on the costa to beyond the middle (basad) of the inner margin, the interspace filled with grey; in the middle of the pinkish posterior area is an indefinite band of pale golden-brown, on the exterior edge of which is an interneural series of fine dark lunules. Secondaries pale brownish.

Expanse 40 mm.

Hab. Bitje, Cameroons, 2000 ft. (*G. L. Bates*).

Type in my collection.

Geometridæ.

Rhamphopteryx prouti, sp. n.

♀. Both wings, as also head, thorax, and abdomen, cinnamon-brown, irrorated with fine dark points, which are more prominent in the somewhat paler secondaries. Primaries with a trace of an oblique stripe from the apex to the middle of the inner margin; the radial area has a small dark cloud and is slightly tinged with greenish. On the underside the oblique stripe of the primaries is more distinct than on the upperside.

Expanse 34 mm.

Hab. Bitje, Cameroons, 2000 ft. (*G. L. Bates*).

Type in my collection, 2 ♀.

One of the specimens has the outer half of both wings irregularly coarsely olive-green, and the opposite wings are blotched with the same colour; it appears to me, however, to be a stain, and not natural.

Pitthea tamsi, sp. n.

♂. Primaries black, with an oblique white, hyaline, subapical bar. Secondaries black, with the central area of the wing from the base to well beyond the cell, and from well above to well below the cell, bright deep ultramarine-blue. Underside: primaries as above; secondaries yellow almost to the termen, which is narrowly black, whilst the apical area is more broadly black; ventral surface of abdomen yellow, dorsum black.

Expanse 44 mm.

Hab. Bitje, Cameroons, 2000 ft. (*G. L. Bates*).

Type in my collection.

Pitthea subflaveola, sp. n.

♂. Head, thorax, abdomen, and both wings sooty black. Primaries with a white spot in the cell and two postmedian ones—the upper one below the costa quadrangular, the lower and larger one wedge-shaped. Secondaries without marks. Underside: primaries like the upperside; secondaries pale lemon-yellow, with the apex rather broadly black and the termen finely black to the anal angle.

Expanse 36 mm.

Hab. Malange, Portuguese West Africa.

Type in my collection.

Neuroxena aberrans, sp. n.

♂. Upperside: both wings black, primaries only with an oblique subhyaline bar across the wing just beyond the cell. Secondaries uniformly black. Underside: primaries as above; secondaries yellow, with the apical area broadly black, gradually narrowing down the termen until it is quite finely black at the tornus, the inner marginal fold yellow.

Expanse 40 mm.

Hab. Bitje, Cameroons, 2000 feet (*G. L. Bates*).

Type in my collection.

Saturnidæ.

Eustera batesi, sp. n.

♂. Both wings dull greyish brown, with erect dark broadish postmedian stripes. Primaries with a subbasal, erect, slightly oblique dark line angled below the costa; four hyaline spots below each other, and a fifth minute one near the angled line. Secondaries with three small hyaline spots below each other, and two smaller ones below each other nearer the base; posterior margin and long tail rather darker than the rest of the wing.

Expanse 78 mm.

Hab. Bitje, Cameroons, 2000 feet (*G. L. Bates*).

Type in my collection.

This will come next or very near to *E. argiphontes*, Kirby.

Cossidæ.

Azygophleps tandoensis, sp. n.

♂. Upperside: primaries dull pale brownish, darker along the costa, with the usual markings of the genus; the interspaces of the veins from 2 to the apex of the wing have lines of very dark brown; the lines are irregular and minutely "crinkled"—the words "finely crenulated" would not suit the description at all, and the only word whereby I can describe the line-formation is the common word "crinkled"; in the fold above vein 1 is a short dark dash, slightly arched. Secondaries grey, with the usual internervular fine network.

♀. Like the male, but paler.

Expanse, ♂ 52, ♀ 72 mm.

Hab. N'Dalla Tando, N. Angola, 2700 ft., October (*Ansorge*).

Types in my collection.

Arbelidæ.

Teragra vogti, sp. n.

♀. Primaries very pale greyish, with a dark brown subbasal area much broken up and extending below the cell to the middle of the inner margin and likewise more or less to the costa; a broadish, indefinite, dark brown postmedian stripe very slightly oblique; the whole wing has rather a mottled appearance. Secondaries pale grey, somewhat irrorated finely with darker brown.

Expanse 35 mm.

Hab. Dunbrody (*Vogt*).

Type in my collection.

Lasiocampidæ.

Pachypasa dallana, sp. n.

♀. Head, face, and palpi dark brown, which colour extends up in a central widening stripe through the collar on to the thorax, where it divides into a V-shaped mark; patagia and rest of thorax paler; abdomen dark brown, especially on the dorsum. Both wings palish brown. Primaries with a curved, longitudinal, paler stripe from the base, below the cell, to the costa, almost into the apex. Secondaries uniformly slightly darker than the primaries.

Expanse 110 mm.

Hab. N'Dalla Tando, N. Angola, January (*Ansorge*).

Type in my collection, a ♀.

Pachypasa subhyalina, sp. n.

♀. Face pale buff-colour, collar and thorax dark grizzled grey; abdomen pale buff-colour. Primaries brownish grey, with a dark, irregular, very oblique, somewhat dentate stripe from the inner margin near the base to well beyond the cell, when it is rounded basewards slightly to the costa; near, beyond this is a second irregular similar stripe extending to the costa almost to the apex, whilst in the subterminal area there is a trace of another stripe, but the specimen is rather rubbed in this part, so that it is uncertain as to its extent. Secondaries rather transparent white, with the apex and termen to vein 2 mauve-grey.

Expanse 86 mm.

Hab. Bitje, Cameroons, 2000 ft. (*G. L. Bates*).

Type in my collection.

Gastroplakæis toroensis, sp. n.

♀. Head, thorax, and primaries cinnamon-brown. Primaries with a trace of a basal grey line; a twin median grey line, which is very irregularly and highly angled; a postmedian twin crenulate grey line, which develops a third section from vein 2; this line, like the median one, is very irregular and angled, beyond this is an indefinite broad stripe of grey scales following the contour of the postmedian lines; a distinct blackish spot at the end of the cell. Secondaries duller brown, with a trace of a cloudy band of shading in the postmedian area.

Expanse 110 mm.

Hab. Toro, Uganda Protectorate, February (*F. J. Jackson*).

Type in my collection, 2 ♀ ♀.

This species will come near *G. rufescens*, Auriv.

Mallocampa jaensis, sp. n.

♀. Head, thorax, and abdomen darkish greyish brown. Primaries greyish olive-brown, base dark for restricted area, followed by a paler stripe and then by a double irregular angled line; cell and a small median area dark brownish grey; a white spot at the end of the cell; a postmedian double, irregular, subcrenulate line defining the dark median area; apex and termen darkish. Secondaries uniform sooty brown.

♂. Apparently similar to the ♀.

Expanse, ♀ 86, ♂ 50 mm.

Hab. Bitje, Cameroons, 2000 ft. (*G. L. Bates*).

Types in my collection, a ♂ and ♀.

I have taken the unusual course of describing and making the type a ♀ instead of the ♂, because the ♀ is in perfect condition, whereas the ♂ is so rubbed, in the outer half of the wings especially, that the pattern is scarcely visible.

Leipoxais batesi, sp. n.

♂. Head, face, and prothoracic tuft ochreous, the latter tipped below with reddish brown; thorax reddish brown; abdomen dull ochreous, with the dorsum of the proximal segments reddish brown. Primaries reddish brown, with a subbasal ochreous stripe, very irregularly and strongly dentate in the cell; a small dark spot in the cell; a postmedian broadish, irregular, ochreous stripe, through which a highly crenulate dark red line runs obliquely; a very irregular, somewhat crenulate, broken, ochreous submarginal stripe; all these stripes have more or less a fine dark external edging; termen finely dark reddish, with paler fringes. Secondaries ochreous, with the termen and costa broadly reddish brown, the latter with a crenulate ochreous dash, basal area pinkish ochreous; on the underside the secondaries are reddish brown, with a subbasal and submarginal, very irregular, ochreous stripe, the inner marginal fold being ochreous.

Expanse 44 mm.

Hab. Bitje, Cameroons, 2000 ft. (*G. L. Bates*).

Type in my collection.

Philotherma tandoensis, sp. n.

♂. Head, thorax, and abdomen very pale grey. Both wings very pale grey, with a slight cinnamon tinge in parts.

Primaries with a slightly curved brown median line and an oblique straight postmedian line not reaching quite to the costa; beyond this the wing is clouded with cinnamon-colour, and there is a submarginal row of nine indefinite internervular grey spots, broken outwards below the sixth; there is a brown spot in the cell pupilled with white, and the median area is somewhat clouded with cinnamon-colour. Secondaries with a postmedian brown line across the wing and a series of eight grey internervular spots that are more prominent on the underside than the upper; the central area is clouded with cinnamon-colour.

Expanse 72 mm.

Hab. N'Dalla Tando, N. Angola, 2700 ft., October (*Ansorge*).

Type in my collection, 2 ♂ ♂.

Chrysopsyche yaundæ, sp. n.

♂. Head, frons, and basal antennal socket russet-brown; thorax very dark olive-green; abdomen pale brown. Primaries very dark olive-green, with a trace of a dark subbasal transverse stripe, and also a trace of a median stripe. Secondaries dark sooty brown with paler fringes.

Expanse 38 mm.

Hab. Cameroons (Yaunde to Yoko), 2000 ft. (*G. L. Bates*).

Type in my collection.

Zygænidæ.

Saliunca flavifrons, sp. n.

♂ ♀. Collar, head, face, palpi, proboscis, and front femora bright golden yellow; basal fifth of antennæ golden-yellow in ♀ only. Primaries steel-blue with just a tinge of green; well beyond the cell in the radial area is an indefinite golden-bronze patch, looking purple in some lights. Secondaries blackish, with the area below the cell slightly hyaline, and likewise the basal part of the abdominal margin, but vein 1 *a* is broadly darkened. Underside: the primaries have the indefinite golden-bronze patch in the radial area exaggerated into a marked ochreous large spot.

Expanse, ♂ 33, ♀ 46 mm.

Hab. Bitje, Cameroons, 2000 ft. (*G. L. Bates*).

Type in my collection, 2 ♂ ♂, 2 ♀ ♀.

At first I thought this might be the female of *S. ventralis*.

Jordan, but the whole of the frons and head is so different, as also the tone of the primaries, that I have no doubt it is distinct.

Toosa batesi, sp. n.

♀. Head, eyes, and antennæ lustrous metallic green; palpi bright carmine, with minute end-joint tipped with black; legs metallic green above. Both wings above and below dark lustrous metallic green without any markings at all.

Expanse 40 mm.
Hab. Bitje, 2000 ft., Cameroons.
Type in my collection.
This species is near *T. glaucopiformis*, Walker.

XLVII.—*The Chordotonal Organs of the Antenno-maxillary Complex in the Larvæ of Cyclorrhaphous Diptera.* By D. Keilin, Sc.D.

(From the Molteno Institute, University of Cambridge.)

[Plate VIII.]

In larvæ of Cyclorrhaphous Diptera the head is divided by means of a deep longitudinal groove into two soft lateral lobes, each bearing several sensory organs. Of the latter, the most important are the short bell-shaped antennæ and the sessile maxillary palps, composed of several small sensory papillæ surrounded by chitinous rings. The nature of all these organs was recognised by Weismann (1864) in the larvæ of *Musca*, and by Wandollek (1898) in the larvæ of several other Cyclorrhaphous Diptera. We know now that each of these organs is connected with a well-developed nerve ganglion or bulb, that the maxillary ganglion (Pl. VIII. figs. 1 & 4, *g.m.*) is united by means of a long nerve-cord to the suboesophageal ganglion, while the antennary bulb (*g.a.*) is connected with the supraœsophageal ganglion.

In a great majority of species the antennæ are distinctly separate from the maxillary palps, their corresponding nerve-bulbs being also independent from each other. In these forms from the middle of the antennary nerve-bulb there arises a ganglion (Pl. VIII. fig. 4, *a.m.g.*) which is directed towards, and terminates at, the base of some of the papillæ of the maxillary palp. In addition to these structures, the head of *Drosophila* larva examined by transparency shows a chordotonal organ (Pl. VIII. fig. 4, *ch.o.*) stretching between the antenno-maxillary ganglion and the ventral wall of the head. This organ is of a monoscolopal type.

In the larvæ of *Platychirus scutatus*, Meig. (Syrphidæ), the antennæ are fused with the maxillary palps, forming a single antenno-maxillary complex organ. Here, the nerve-bulbs which are at the base of these organs are fused in the longitudinal plane. The antenno-maxillary complex of Syrphid larvæ is not fully transparent, so that the chordotonal organs can be studied only in longitudinal sections of the larvæ fixed in Carnoy fluid or in Bouin's picro-formol and stained, preferably in Mann's methyl-eosin.

Fig. 1 (Pl. VIII.), which represents one of these sections, shows the two nerve-bulbs of the antenna (*a.g.*) and maxillary palp (*m.g.*) fused into one mass with numerous chromatic nuclei, each containing a small peripheral karyosome. A careful examination of the sections also reveals the presence of chordotonal organs completely embedded in the cellular mass of the bulbs. The chordotonal organs found in this region belong to two types: mono- and biscolopal. The scolopales give off numerous radiating fibrillæ (Pl. VIII. figs. 2 & 3, *f.*), which connect them with the envelope of the scolopal cell. In the biscolopal organ the terminal knob (Pl. VIII. fig. 3, *t.k.*) is composed of three portions, two of which are connected with corresponding scolopales, while the third is median and placed anteriorly. The two axial filaments (Pl. VIII. fig. 3, *a.f.*), the nuclei of the ligament (*n.e.*) and of the scolopal nerve-cell (*n.n.*) can be easily detected on examining two or three successive sections. As far as I am aware, no scolopal organs embedded in the nerve-bulbs have been hitherto described. The antennæ and maxillary palps in larvæ of Cyclorrhaphous Diptera, although so much reduced in size as to be almost non-existent as appendages, still retain the chordotonal organs, which are known to occur in fully-developed segmented antennæ or palps of other Insects and their larvæ (Bolles Lee, 1884, and Janet, 1894).

This observation is in complete agreement with our generalization previously discussed (1915) concerning the relationship between the appendages and the sensory organs in Insects. According to this generalization, the head in the larvæ of Cyclorrhaphous Diptera has undergone a most profound modification, especially in the structure of the mouth-parts, which are probably néo-formations, having nothing in common with the original mouth-parts of more primitive larvæ. In spite of these modifications, the "sensory formula" of the head in the cyclorrhaphous larva remains as complete as in other Insect larvæ. We are dealing here, on the whole, with a phenomenon similar to that of the persistence and specialization of the three pairs of thoracic ventral sensory organs in the Dipterous larvæ in place of the legs, which have completely disappeared. In Dipterous larvæ, and possibly in Insects generally, the disappearance of an appendage as such does not involve the disappearance of its sensory organs. On the contrary, the latter may remain and often specialize in function after the complete disappearance of the original appendage.

REFERENCES.

GRÄBER, V. (1882.) "Die chordotonalen Sinnesorgane und das Gehör der Insekten." Arch. für mikroskop. Anat. xx. p. 506.

JANET, C. (1894.) "Sur les nerfs de l'antenne et les organes chordotonaux chez les Fournis." Compt. rend. Ac. Sc. Paris, cxviii. p. 814.

KEILIN, D. (1915.) "Recherches sur les larves de Diptères Cyclorrhaphes." Bull. Scient. France et Belgique, sér. 7, xlix. pp. 15–198. (See pp. 173–177.)

LEE BOLLES, A. (1884.) "Les organes chordotonaux des Diptères et la méthode du chlorure d'or (observation critique)." Recueil Zool. Suisse, ii.

——. (1884.) "Bemerkungen über den feineren Bau der Chordotonal-Organe." Arch. für mikroskop. Anatomie, xxiii. pp. 133–140.

WANDOLLEK, B. (1898.) "Die Fühler der cyclorhaphen Dipterenlarven." Zool. Anz. xxi. p. 283.

WEISMANN, A. (1864.) "Die nachembryonale Entwicklung der Musciden nach Beobachtungen an *Musca vomitoria* und *Sarcophaga carnaria*." Zeitschr. für wiss. Zool. xiii. pp. 107–220.

EXPLANATION OF PLATE VIII.

Letters common to all figures:—*a*, antenna; *a.f.*, axial filament; *a.m.g.*, antenno-maxillary ganglion; *c*, ventral sensory organ of the head; $ch.o_1$, monoscolopal chordotonal organ; $cho._2$, biscolopal chordotonal organ; *e*, envelope-membrane of scolopal organ; *f*, radiating scolopal fibrillæ; *g.a.*, antennary ganglion; *g.m.*, maxillary ganglion; *m*, maxillary palp; *n.e.*, nucleus of the ligament; *n.n.*, nucleus of chordotonal nerve-cell; *sc.*, scolopal organ; *t.k.*, terminal knob.

Fig. 1. *Platychirus scutatus*, Mg., longitudinal section of the antenno-maxillary complex of larva, showing nerve-ganglia and the chordotonal organs.

Fig. 2. Monoscolopal chordotonal organ of this larva.

Fig. 3. Biscolopal chordotonal organ of this larva corresponding to $cho._2$ of fig. 1.

Fig. 4. *Drosophila ampelophila*—antenno-maxillary complex of the head of the larva, seen by transparency.

XLVIII.—*On the Structure and Development of* Stauria favosa (*Linnæus*). By Stanley Smith, M.A., D.Sc., F.G.S., and T. A. Ryder, Ph.D., B.Sc., F.G.S.

[Plate IX.]

The monotypic genus *Stauria* was founded by H. M. Edwards and J. Haime in 1850 (Mon. Brit. Foss. Corals, pl. lxiv.) upon *Madrepora favosa,* Linnæus, 1758 ('Systema Naturæ,' ed. x. p. 796), although they unwarrantedly changed the trivial name to *astreiformis. Madrepora favosa* is a Silurian species common in Gotland, but restricted, according to Lindström, 1888 ('List of the Fossil Faunas of Sweden; Upper Silurian,' p. 21), to stage *f* (crinoidal and coralliferous limestones = Aymestry Limestone or Ludlow). *M. favosa* is one of the corals described by Linnæus (1745) in his 'Dissertatio Corallia Baltica adumbrans submittit Henricus Fougt,' p. 26, fig. xvi. Edwards and Haime (1851, Pol. Foss. des Terr. Pal. p. 316, pl. i. figs. 1, 1 *a–d*) give a good description and good figures * of the form, yet leave room for a more detailed account of its internal structures; and G. v. Koch (1883, in his paper "Die ungeschlechtliche Vermehrung (Theilung und Knospung) einiger Palæozoischen Korallen vergleichend betrachtet," Palæontographica, vol. xxix. (1883), pp. 327–348, pls. xli.–xliii.) discusses the development of the hystero-corallites. Koch (pp. 329–330, pl. xl. figs. 12–16) demonstrates that in the buds certain septa are continuous with those of the parent corallite, whilst the rest grow out from the sides of the four "Theilungssepten" which divide the parent calice into quadrants. He did not realise, however, that these new septa did not arise directly from four divisional septa, but from new epithecal tissue superposed upon them.

Otherwise our work confirms Koch's findings, and merely adds to his observations.

Form and Structure.

Stauria favosa is a compound coral, which forms compact colonies. The corallum is either truly cerioid (Pl. IX. fig. 4) or phaceloid, but with the corallites so closely packed that their outline is modified by mutual pressure (Pl. IX. fig. 1). The calices, which may be shallow or moderately deep, display the characters seen in transverse section.

---

* Fig. 1 *d,* which illustrates the vertical section, indicates a much greater and more regular development of dissepiments and more regularly disposed tabulæ than we have seen in any of the sections we have examined, and in these respects we believe the figure is inaccurate.

The distinguishing character of the genus is that four of the major septa are longer and stouter than the rest, and, meeting axially, divide the transverse section into four quadrants, usually more or less equal in size. These four septa—the "Theilungssepten" of Koch,—which are the cardinal, counter, and alar septa, form a conspicuous cross, and their more or less dilated axial edges fuse to form the solid axis seen in vertical section (Pl. IX. fig. 3). Most of the other major septa terminate freely, but some may abut against a limb of the cross, or against a neighbour, or may even extend to the axis. The minor septa are much shorter than the major, but vary much in length. Between the septa there is characteristically a narrow peripheral zone of secondary tissue.

The actual number of septa in any particular corallite depends largely upon its size. In the cylindrical corallites of R. 23801 (Pl. IX. figs. 1 & 2), which have an average diameter of 8 mm., there are approximately twenty-seven fully-developed major septa *; in the prismatic corallites of R. 23838 (Pl. IX. fig. 3), with an average diameter of 6 mm., about twenty-two; and in 48287, also prismatic, but with corallites nearer 5 mm. in diameter, about twenty major septa. The distribution of septa among the quadrants varies, but usually not very greatly. There are generally more septa in the two cardinal than in the two counter quadrants. The actual number of fully-developed major septa † in each of the four quadrants in eight corallites of specimen R. 23801 are given below :—

Number of major septa in corallites (including the "Theilungssepten")	28	27	27	27	26	26	25	24
Metasepta in cardinal quadrants ..	5	9	7	5	7	7	6	5
	7	6	6	8	5	5	6	6
Metasepta in counter quadrants ..	7	3	5	6	5	4	5	5
	5	5	5	4	7	6	4	4

In many of the corallites of R. 23801 the cardinal fossula is well marked, being defined by two unusually long major septa, which, running parallel with the cardinal septum, abut against the two alar septa—in most at an angle of approximately 90°. Within the fossula, and lying on both sides of the cardinal septum, are two septa which are shorter

---

* In one corallite as many as thirty-one major septa were counted.

† Excluding the two young metasepta in the cardinal fossula.

than the major, but longer than the minor, septa; we consider these to be major septa which are not yet fully developed.

The fossula as thus described is well seen in most of the corallites figured (Pl. IX. figs. 1 & 2), and is indicated in one or two convenient places by the letter F.

In the smaller prismatic form, R. 23838 (Pl. IX. fig. 4), in which the "Theilungssepten" are not so strongly differentiated from the rest of the septa, and in which peripheral secondary tissue is much less developed, the fossulæ also are less well-marked, but, nevertheless, can be clearly recognised in several of the corallites, and show precisely the same characters as those in the larger and better developed specimen, R. 23801.

The tabulæ are widely, but unevenly, spaced, and are irregular in all their characters. Some are strongly convex distally, whilst others are practically flat; and, although most slope downwards towards the axis, others lie horizontally or slope in the opposite direction (see Pl. IX. fig. 3).

The dissepimental tissue is but poorly represented. The dissepiments, with the spaces they enclose, form large, flattened, peripheral vesicles; they are only sporadically developed, and do not constitute a persistent zone. The dissepiments are indicated in our figure of the longitudinal section (Pl. IX. fig. 3) by the letter D.

DEVELOPMENT OF THE HYSTERO CORALLITES.

Gemmation is parricidal, and the gemmæ, which are large and only few in number, entirely cover the surface of the parent calice. Typically four buds are developed, one on each of the four quadrants. Occasionally only three[*], or even two, buds develop, in which case one or both cover two quadrants. Over the central part of the calice the daughter corallites lay down new epitheca and septa, which bear little or no relationship to the structures upon which they are superposed, but at the margin of the older corallite they carry forward its epitheca and septa. For the epitheca and septa thus common to both parent and daughter corallite we here propose the term "atavo" epitheca and "atavo" septa, to distinguish them from the "neo" epitheca and "neo" septa, which belong to the daughter corallite alone. "Atavo" and "neo" may be used with the same significance in regard to other structures.

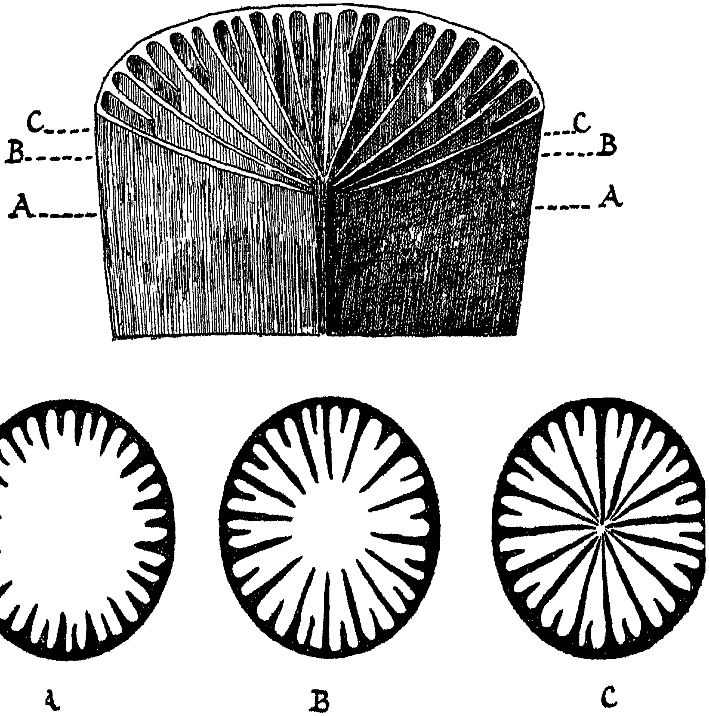
---

[*] Edwards and Haime's figure (1851, pl. i. fig. 1 *b*) shows three buds rising from a calice.

This does not necessarily assume any fundamental difference between the "atavo" and "neo" tissue. We only wish the terms to imply that atavo tissue is similar, and neo tissue dissimilar, to the old skeletal tissue upon which it is laid.

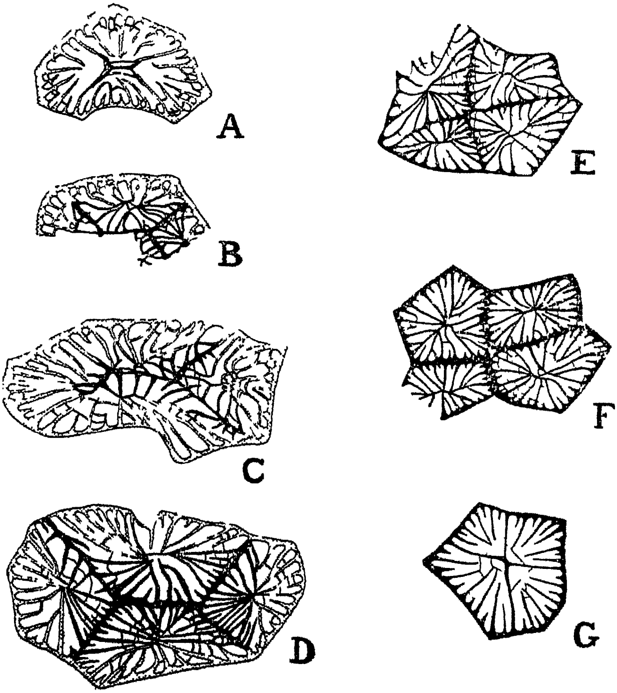
Since the floor of the calice slopes downwards towards the axis, and since the young corallites fix their foundations

Text-fig. 1.



A, B, and C illustrate the appearance of the septa in transverse sections through the calice at levels A, B, and C respectively. For simplicity, the new tissue developing within the calice is omitted.

upon this sloping floor, it naturally follows that a series of transverse sections through the region of gemmation at first displays the tissue of the daughter corallites in the axial region of the parent (text-fig. 2), and suggest the gradual extension of new tissue from the axis to the periphery, which undoubtedly is actually the case. At the same time, Text-fig. 2.



Transverse sections illustrating the development of the hystero corallites of *Stauria favosa* (Linnæus) (enlarged approximately 2·5 times).

Sections A–F were cut from British Museum specimen R. 23838. Silurian, stage *f* of Lindstrom (=Lower Ludlow). Quarry near Pafwolds, Gotland. Collected by Dr. F. A. Bather. Section G is from British Museum specimen 48287. Silurian, Gotland. Lindström Coll. The shaded portions of the figures A–D represent the tissue of the parent corallite, and the black that of the daughter corallites; in figs. E and F the atavo and neo tissue are not thus differentiated, but both shown in black.

Fig. A.—Earliest hystero-brephic stage observed, showing the new epithecal tissue beginning to develop at the centre of the parent calice.

Figs. B & C.—A later hystero-brephic stage, in which the neo epitheca has extended along the Theilungssepten nearly to the periphery of the older corallite, and in which the earliest neo septa have been laid down.

Fig. D.—Latest hystero-brephic stage. The new epitheca-walls of the four daughter corallites are now completed.

Fig. E.—Early hystero-neanic stage.

Fig. F.—Late hystero-neanic stage.

Fig. G.—Ephebic stage. The Theilungssepten are distinct and the metasepta quasi-radially arranged. (In this particular corallite the cardinal fossula is inconspicuous.)

these sections show a retreat of the septa of the older corallite towards its periphery; but this is due to the fact that the distal edges of these septa slope inwards with the rest of the calice, and therefore appear progressively shorter at successively higher levels, as diagrammatically shown in text-fig. 1.

The atavo septa in the daughter corallite are at first very short, since only the more peripheral parts of the septa of the parent continue upwards. One of them, at the close of the neanic stage, develops in the same way as do the cardinal and alar septa, and forms one of the four limbs of the conspicuous cross.

Between the stages represented by text-fig. 2, A and B, a cardinal septum makes its appearance in each of the four young corallites, on the side nearest the axis of the parent corallite, and more or less midway between the "Theilungsepten." This cardinal septum is probably superposed upon the more axial part of that septum, the peripheral part of which is carried forward on the opposite side of the bud as the counter septum. The cardinal septum is followed by the alar and earliest metasepta; the insertion of the metasepta proceeding, it would seem, at the cardinal and two alar fossulæ in the usual way.

The neo septa as they increase in number force the two alar septa into positions approximately at right angles to the cardinal septa (text-fig. 2, E), and cause the atavo septa to take an oblique arrangement (text-fig. 2, D and E).

Still further development brings all the septa into the quasi-radial symmetry of the adult corallites (text-fig. 2, G). During the hystero-neanic stages (text-fig. 2, E and F) most of the major septa meet at the axis of the corallites, and the "Theilungssepten" are undifferentiated from the rest. It is not until the ephebic stage is approached that the former retreat from the axis, and the latter become dilated (text-fig. 2, F). It should be noted that the "Theilungssepten" of the daughter corallites are orientated approximately at 45° to those of the parent, and thus the relationship of the new crosses to the older one is that of four St. Andrew's Crosses lying with the limbs of a St. George's Cross.

In conclusion, we thank Dr. F. A. Bather for the loan of specimens of *Stauria* in the British Museum, and state that all the sections prepared are preserved there along with the original material.

EXPLANATION OF PLATE IX.

Stauria favosa.

The letter R. followed by a number is the British Museum register-number of the specimens.

Fig. 1. Transverse section through a group of cylindrical corallites, R. 23801. Silurian, Rojio, east of Angelin, Gotland. × 2·5 approx.

Fig. 2. The same, illustrating gemmation (see page 342). Same specimen as fig. 1. × 3·0 approx. Cardinal fossulæ indicated by "F" in figs. 1 and 2.

Fig. 3. Longitudinal section from same specimen as figures 1 and 2. Dissepiments indicated by "D." × 2·5 approx.

Fig. 4. Transverse section of a group of prismatic corallites, R. 23838. Silurian, stage *f* (= Lower Ludlow), quarry near Pafwolds, Gotland. × 2 approx.

XLIX.—*New and little-known Species of Neuroptera in British Collections.*—Part III. By P. Esben-Petersen, Silkeborg.

[Plates X. & XI.]

By the kindness of the Director, Dr. Guy A. K. Marshall, I have had the pleasure of examining some Neuroptera belonging to the Imperial Bureau of Entomology. Below I give descriptions of the new species found in the collection, together with descriptions of two new Myrmeleonids from Trinidad, collected by the late Dr. C. L. Withycombe, of Cambridge.

The new species described belong to the following families:—

Ascalaphidæ: *Allocormodes woodi, Encyoposis lloydi.*

Mymeleonidæ: *Myrmeleon nigrinus, Glenurus withycombei, Elachyleon* (g. n.) *punctipennis.*

Osmylidæ: *Spilosmylus ceyloniensis.*

Allocormodes woodi, sp. n. (Pl. X. fig. 1.)

Labrum dark brown, shining; face yellowish brown; vertex yellowish brown with darker spots. Basal antennal joint blackish (rest or antennæ wanting). Head with long black hairs. Thorax above dark brown, with reddish-yellow spots and long greyish-white hairs; below shining brownish black and blackish-haired. Legs brown. Wings long, rather narrow, and with rounded apex. Longitudinal veins mostly yellowish brown, cross-veins mostly blackish brown and narrowly brownish-shaded. Wings tinged with dark brown, with the exception of the costal area, the apical part, and a rather broad area along the hind border. Along the hind margin of the dark brown area three oblong darker markings in the fore wings, two in the hind wings. Between the costal margin of fore wing and the apical oblong dark marking a rather large white spot, not touching the tip of the wing. In the corresponding area of the hind wing a smaller dark brown spot.

Fore wing 35 mm.; hind wing 31 mm.

NYASALAND: 1 ♀ (*R. C. Wood*). British Museum.

As to the markings of the wings, this new species is quite unlike the other known species of the genus. I have named this beautiful Ascalaphid in honour of the collector.

Encyoposis lloydi, sp. n. (Pl. X. figs. 2 & 3.)

Antennæ as long as the fore wing from base to stigma, brownish yellow, with narrow black annulations and with black club. Face whitish, with a more or less distinct brown cross-band below the antennæ and with long yellowish-white pilosity. Vertex brown. Thorax greenish yellow, with black streaks following the sutures; these streaks are broadest on the dorsum. Legs black. Abdomen greenish yellow, with a rather broad blackish streak at each side (pleuræ), a narrow black median streak ventrally, broadened towards apex; dorsum of abdomen in the female sex with a large almost circular spot on each segment; in each of the yellowish spots is placed a small black dot or a fine longitudinal black line; in the male sex the dorsum of the segments is greenish yellow, with a black centrally-placed dot or a fine black longitudinal median line. Anal appendages of the male brownish yellow with blackish bristles. Membrane of wings hyaline, in fully-matured specimens with a yellowish tinge. Venation dark brown, yellowish at the base. Pterostigma long, blackish brown.

Fore wing 25–30 mm.; hind wing 21–25 mm.

N. NIGERIA: Azare, 3 ♂, 2 ♀, 1926 (*Dr. Ll. Lloyd*). British Museum.

Ameropterus delicatulus, McLachl. (Pl. X. fig. 4.)

Colobopterus delicatulus, McLachlan, J. Linn. Soc. Lond. p. 250 (1871); v. d. Weele, Ascalaphiden, Coll. Selys, p. 131, fig. 89 (1908).—Amazon.

BRITISH GUIANA: Tuwakuri R. (section 3), 1 ♂, vii. 1919 (*A. A. Abrahams*).

Of this species, only a female specimen (in the British Museum) is known. I believe I am right in referring the specimen to MacLachlan's species, but as it is a male, and as it does not agree with the description given of the female in every respect, I give here a short description of it, together with a figure of its wings.

Face and vertex shining black, clypeus brown; lower part of each eye narrowly margined by a yellowish streak. Head with long blackish pilosity. Antennæ longer than the fore wing, black; basal joint dark brown; the club black, with a yellowish-brown band in its middle. Thorax jet-black, with a broad yellowish longitudinal median streak; venter yellowish, bluish-tinged and whitish-haired. Femora yellowish, with a broad dark band at apex; tibiæ yellowish, with two indistinct narrow black bands, one near base and the other at apex; tarsi dark; spurs and claws brown. Abdomen slender and dark; hind margin of the segments narrowly brownish bordered; each segment with traces of three longitudinal pale streaks dorsally (the specimen is so fully matured that the colours have almost disappeared). Wings hyaline, iridescent; tip of hind wing sooty-brown. Venation black; stigma long, brownish black.

Antenna 31 mm.; fore wing 23 mm.; hind wing 20 mm.

Myrmeleon nigrinus, sp. n. (Pl. XI. fig. 5.)

Labrum, clypeus, genæ, and lower part of the face strongly yellowish; a very narrow streak along margin of the eyes also yellowish. The face below the antennæ shining black. Vertex black, rugose and somewhat raised. Palpi brownish black. Antennæ short, black, and clavate. Prothorax black, broader than long, with a narrow interrupted yellowish longitudinal median streak, and with rounded front angles which are narrowly yellowish-margined. Meso- and metathorax and abdomen black and with very short hairs. All the coxæ and legs strongly reddish yellow; the apex and the posterior margin of fore femora, the apical three-fourths of intermediate femora, and a band near tip of hind femora shining blackish; a band at the tip of each tibia and a streak along the front part of fore tibiæ and along hind part of intermediate and hind tibiæ shining black; tarsi shining black. Spurs of fore legs straight and almost as long as first and second tarsal joints united. Wings hyaline, shining, unspotted and rather broad; fore wings almost rounded at tip, hind wings more pointed. Venation dark; *Sc* and *R* sometimes paler, and in that case with dark streaks. All the veins with short hairs. Stigma white, oval and very distinct, largest in the fore wings ; it does not reach the front margin. Apical area rather broad, with cross-veins forming two irregular rows. In the costal area of the fore wings some veinlets crossed just before stigma.

Abdomen 24–29 mm. ; fore wing 36–45 mm. ; hind wing 35–44 mm.

CEYLON : Woodside, Urugalla, 1 specimen, iv. 1923; British Museum. SUMATRA : 1 specimen, vi. 1916 (*Edw. Jacobson*). PHILIPPINES : 1 specimen, 4. xii. 1915; my collection.

I have known this species for several years, but until now I have postponed describing it. My description is based upon the specimen in the British Museum, and although it differs in some small points from the two other specimens, I consider them as belonging to the same species. The specimen from the Philippines is the smallest, and its wings are a little more obtusely pointed at apex. The abrupt prothoracic yellowish median streak is hardly indicated in the two other specimens; their intermediate and hind coxæ are pruinose and not yellowish, and the tibiæ of the specimen from Sumatra are almost quite black. As to the number of crossed veins in the costal area, there is much variation. In the right hind wing of the specimen from Ceylon three crossed veins are found before the stigma, none in the left hind wing or in the hind wings of the two other specimens. In the specimen from the Philippines, only one crossed vein is found in the costal area of the right fore wing, three in the left ; in the specimen from Sumatra four crossed veins are found in each of the fore wings. A number of branches from Cu_2 in the fore wing are connected by a series of cross-veins in all the three specimens.

The new species is nearly allied to *Myrmeleon trivialis*, Gerst., from the Himalaya, but *trivialis* has more pointed wings and no crossed costal veins before the stigma.

I have not placed *nigrinus* in the genus *Baliga*, Navas (Revue Russe d'Entomologie, p. 110, 1912) because it has short and rather strongly clubbed antennæ, and because the genotype of *Baliga*, *Myrmeleon asakuræ*, has, as a rule, no crossed branches from Cu_2 in the fore wing. In *asakuræ* the stigma is very large and touches the front margin of the wing. I consider, however, *asakuræ* to be an Eastern (insular) form of the well-known *M. eurystictus*, Gerst., from Burma and Assam. Navas has erected the genus *Balaga* (Revue Russe d'Entom. p. 111, 1912) for the common Japanese species *Myrm. micans*, McLachl., and in the same genus he has placed a species described by himself, *Balaga nitens*, from China. I have already stated (Ent. Mitt. p. 223, 1913) that *Balaga nitens*, Navas, is the same as the widespread species *Myrm. sagax*, Walker. Since that time I have compared a specimen of *Balaga nitens* (named by Navas himself) in the Vienna Museum with a photograph of the type-specimen of *M. sagax*, and this comparison has confirmed my statement.

Glenurus withycombei, sp. n. (Pl. XI. fig. 6.)

Head yellowish white; apical joint of labial palpi dark at apex; below and between the eyes a triangular black spot; above the antennæ a black transverse band; on vertex two transverse rows of black spots. Antennæ long and strongly clavate, blackish at base and becoming brown towards apex, and with narrow pale annulations; club black. Prothorax much longer than broad, dark brown, with a narrow longitudinal yellow median line and with narrow yellowish lateral margins. Meso- and metathorax dark brown and with yellowish spots or streaks. Underside of thorax dark brown with yellowish streaks, placed in the direction of the yellowish lateral margins of prothorax. Abdomen dark (somewhat discoloured); some of the segments in the basal part with pale spots dorsally. Legs slender and long, yellowish white; femora with dark ring at apex; tibiæ with a dark band near base and another at apex; tarsal joints dark at their apex. Spurs whitish, straight and very long, a little longer than first and second tarsal joints united. First tarsal joint almost as long as second, third, fourth, and fifth joints together; fifth joint as long as second, third, and fourth united. Membrane of wings hyaline; hind margin of apical third brownish-tinged. Venation pale; several small brown dots where the cross-veins meet the longitudinal veins. Some larger brown spots, especially in the fore wings. In the fore wing the fork of Cu_1 much further out than origin of *Rs*. In the hind wing one cross-vein before origin of *Rs*; Cu_1 is very short and does not reach halfway to fork of M_2. No Banksian lines. A few cross-veins in the apical area of each wing.

Fore wing 30 mm.; hind wing 31 mm.

TRINIDAD: St. Augustine, 1 ♀, vi. 1924 (*Dr. C. L. Withycombe*). British Museum.

I name this interesting species in honour of the collector. At first sight it much resembles *Glenurus cerverai*, Navas (' Broteria,' p. 118, fig. 3, 1921), from Cuba, of which species a specimen is at hand. The two species are, however, very easily separated ; in *cerverai* Cu_1 in the fore wing forks at the level of the origin of *Rs*, and in the hind wing Cu_1 is much longer than in *withycombei.* They differ also as to the markings of the body and of the wings.

ELACHYLEON, gen. nov.

Antennæ long, gradually thickened towards apex. Eyes prominent. Prothorax narrow, a little longer than broad. Legs long and slender ; femur of fore legs as long as tibia. Spurs as long as basal tarsal joint. First, second, third, and fourth tarsal joints of equal length (fourth joint perhaps the shortest) ; fifth joint as long as third and fourth united. In fore wing *Rs* arises before fork of Cu_1 ; Cu_2 straight, its tip curved inwards and united with Cu_{1p}. *2A* connected to basal part of *1A* by a short cross-vein, and coalescing with *3A* for a short distance. Neither *2A* nor *3A* is forked at the tip. In hind wing one cross-vein before origin of R_5. No Banksian lines. A series of cross-veins in the apical area of both pairs of wings. Along apical margin of the wings the tip of the veins is strongly thickened, almost clavate.

Genotype, the species described below.

Elachyleon punctipennis, sp. n. (Pl. XI. fig. 7.)

Head and palpi pale brown ; a dark brown transverse band below and a black one above the antennæ. On vertex two black spots. Antennæ longer than head and thorax together, yellowish brown and with dark brown annulations. Prothorax reddish or yellowish brown, unmarked ; meso- and metathorax yellowish brown above and with three black longitudinal streaks, blackish below and with a yellowish streak along each side. Legs testaceous ; knees, tip of tibiæ and of fifth tarsal joint black ; legs with dark bristles placed on small black dots. First and second abdominal segment (the rest of abdomen lost) testaceous ; two oblong spots near front margin of second segment and two other spots near hind margin of the two segments black ; underside of first and second segments with two oblong black spots near hind margin of each segment. Wings hyaline ; venation dark with whitish interruptions ; along apical margin of the wings the tip of the veins is strongly blackish. Pterostigma yellowish ; a brown obliquely-placed streak at fore end of it in the fore wing. Three other conspicuous brown spots also in the fore wing ; two in the hind wing.

Fore wing 23 mm. ; hind wing 23 mm.

TRINIDAD: St. Augustine, 1 specimen, 20. v. 1925 (*Dr. C. L. Withycombe*).

The specimen is in the British Museum, and Dr. Withycombe remarks that it was taken at light.

Dictyoleon nervosus, Esb.-P.

Dictyoleon nervosus, Esb.-P. Proc. Linn. Soc. N.S. Wales, p. 585, pl. 44. fig. 18 (1923).—Fiji Islands.
Weeleus triseriatus, Banks, Bull. Mus. Comp. Zool. p. 435 (1924).—Wainganitu, Fiji Islands.

FIJI Is.: Suva, 27. iv. 1923 (*H. W. Simmonds*). British Museum.

Spilosmylus ceyloniensis, sp. n. (Pl. XI. fig. 8.)

Head yellowish brown; below the base of the antennæ a brown spot, on vertex a dark brown spot, enclosing the ocelli. Antennæ brownish yellow, basal joint darker. Prothorax narrow, a little longer than broad, pale brown, with trace of three longitudinal black streaks. Legs brownish yellow. Abdomen discoloured and shrivelled. Wings rather broad and somewhat pointed at apex. Membrane hyaline, with a yellowish tinge, especially in the hind wings. Venation brown with whitish interruptions. *Sc* and *R* in the fore wing with at least seven blackish-brown streaks from base to stigma, the first streak being where the first cross-vein from *M* touches *R*. In the subcostal area at least seven blackish-brown streaks placed between those on *Sc* and *R*. The costal cross-veins mostly whitish in front of the whitish parts of *Sc* and *R*. Stigma yellowish brown, but darker at both ends. Several cross-veins in the discal area, the outer series of gradate cross-veins, and the branches from *Cu*, *M*, and *Rs*, with more or less brownish shading along the posterior margin of the wing. The first cross-vein between *M* and *Rs*, and distad of the basal chitinous dot, touches the stem of *Rs* and not the first branch from *Rs*. Between *M* and Cu_1 and close to the base of the wing an area is found without cross-veins. No chitinous spot at posterior margin. In the hind wing the whitish interruptions of the brownish venation less numerous, except in the costal area. *Sc* and *R* with dark streaks as in the fore wings, but no dark lines are present in the area between them. No cross-vein shaded.

Fore wing 23 mm.; hind wing 20 mm.

CEYLON: Nuwara Eliya, 2 specimens, 24. iv. 1914. British Museum.

So far as I can see, the two specimens belong to the same sex and are probably females, but, owing to the condition of the abdomen, I cannot reach any definite conclusion. I have placed the new species in the genus *Spilosmylus*, although I know very well that it can hardly go in that genus, as this is restricted by L. Krüger; but, on the other hand, I cannot find any better place for it at present. The species very much resembles *Osmylus conspersus*, Walker, of which species I possess a photograph taken from the type-specimen. In *conspersus* several costal cross-veins in the fore wing are shaded; in the basal part of the area between *M* and Cu_1 several cross-veins seem to be present; I think, however, that they may be "false" cross-veins—that is, narrow transversely-placed brown streaks. The apical third part of the hind wing with several shaded cross-veins.

EXPLANATION OF THE PLATES.

Plate X.

Fig. 1. *Allocormoides woodi*, sp. n., ♀.
Fig. 2. *Encyoposis lloydi*, sp. n., ♂. Anal appendages seen from side and from below.
Fig. 3. *Encyopsis lloydi*, sp. n., ♂.
Fig. 4. *Ameropterus delicatulus*, McLachl., ♂. The basal part of costal area in the fore wing of the specimen photographed is bent down.

Plate XI.

Fig. 5. *Myrmeleon nigrinus*, sp. n.
Fig. 6. *Glenurus withycombei*, sp. n.
Fig. 7. *Elachyleon punctipennis*, gen. et sp. n.
Fig. 8. *Spilosmylus ceylonensis*, sp. n.

L.—*Two new* Syrphidæ *from Uganda (Diptera).*

By C. H. Curran, Ottawa, Canada.

Among several interesting Syrphidæ received from Mr. H. Hargreaves, Kampala, Uganda, were the two species described herewith. The types will be deposited in the British Museum of Natural History.

Xylota hancocki, sp. n.

Blackish blue, in some lights appearing mostly deep bluish. Length 10 mm.

Male.—Head black, the lower two-thirds of the occiput, face, and frontal triangle silvery-grey pollinose; the anterior half of the frontal triangle, a band below the antennæ, and a triangular spot on the cheeks bare. Pile white, a few black hairs on the vertical triangle. Face receding on the upper two-thirds, thence gently produced to the oral margin. Eyes contiguous for a distance almost equal to the length of the frontal triangle; ocellar triangle situated before the middle of the vertical triangle, the vertex with a conspicuous tubercular swelling. Antennæ black; arista long and slender.

Mesonotum bluish laterally, with short black hair and a pair of white pilose vittæ, which, in some views, extend back to the posterior fifth; lateral margins, posterior calli, scutellum, and pleura also with white pile, and there is a large sericeous spot inside either humerus. Scutellum with a shallow apical marginal groove and a pair of black marginal bristles.

Legs clothed with short white pile (except the posterior fifth of the posterior femora), which causes them to appear silvery in some views. Posterior femora only moderately large, with black spines below and a large patch of coarse tawny setulæ on the lower surface near the base. Posterior trochanters with a small sharp tubercle.

Wings smoky, paler on the basal half. Squamæ white, with brown border and fringe. Halteres orange.

Second abdominal segment with an opaque median vitta which extends strongly along the base of the segment and obscurely along the posterior margin, the third with a broad opaque posterior border which expands strongly in the middle but does not reach the lateral margins, the fourth segment less shining than the others and with a slight violaceous tinge. The pile is very short and black on the dorsum, longer and whitish on the broad lateral margins, expanding somewhat along the metallic portions of the second and third segments. The fourth sternite and genitalia bear longer black hair; venter pale-haired basally.

Type, ♂, Nkokonjeru, 6000–7000 ft., Uganda, 23–27. xii. 1926 (*G. L. R. Hancock*).

Lejops africanum, sp. n.

Black, the very narrow bases of the posterior four tibiæ obscurely reddish; abdomen with three pairs of rather small triangular hoary spots.

Length 8·5 mm.

Male.—Head yellowish-grey pollinose, somewhat silvery, the front brownish ochreous, the occipital pollen with ochreous tinge above. Hair whitish, with yellow tinge on upper part of the occiput, black on the front. Front at the narrowest part separating the eyes by a little less than the distance between the posterior ocelli, the ocellar region shining black. Face moderately conically produced downwards and forwards. Antennæ black; arista brownish red.

Mesonotum dulled with thin brownish pollen, with a pair of narrow, broadly separated, greyish-yellow vittæ which become obsolete on the posterior fifth, where they merge into a posterior area of less distinct greyish pollen, which forms an obscure prescutellar band; sides of mesonotum broadly but not strikingly yellowish-grey pollinose, the pleura with grey pollen. Pile whitish on the pleura, yellowish dorsally, with a broad band of black hair intermixed with the pale between the bases of the wings. Scutellum shining black, with long pale pile.

Legs black, the coxæ and anterior four femora with fairly dense pale pollen; pile black, black on the anterior surface, the upper posterior edge of the femora, and the upper surface of the anterior tibiæ and on their tarsi; black on the upper and outer surfaces of the middle femora and on most of the middle tarsi and on the posterior femora below, the basal half of their tibiæ except anteriorly, and on the posterior tarsi wholly. Posterior femora strongly swollen, their tibiæ strongly angularly produced on the inner apex.

Wings with slightly brownish tinge; stigma simulating cross-vein. Squamæ white, with very pale yellowish fringe. Halteres yellowish, the knob creamy.

Abdomen opaque black, the apical fourth of the second, third of the third, half of the fourth segment, and the broad lateral margins shining; basal segment greyish pollinose, the sides of the abdomen less evidently so. Second segment with a pair of rather small triangular hoary spots situated mostly before the middle, the spots acute inwardly and very broadly separated from each other, almost extending to the lateral margins of the segment; third segment with similarly shaped spots, but they are nearer the base of the segment; spots on the fourth segment basal, only moderately separated from each other and larger, being more transverse. Pile pale yellowish or cinereous on the basal segment, genitalia, hoary spots and the broad lateral margins of the abdomen, elsewhere somewhat shorter, coarser, and black. Genitalia shining black.

Type, ♂?, Kampala, Uganda, 20. xi. 1926 (*G. L. R. Hancock*).

This is the first record of this genus from the Ethiopian Region, and the species is an extremely interesting one. The species is placed in the genus *Lejops*, Rondani, because of the vein-like stigma and produced posterior tibiæ, although the narrowing front indicates a relationship with *Mesembrius*; but the absence of nodulose hairs on the posterior tarsi excludes it from that genus.

LI.—*New or little-known* Tipulidæ (*Diptera*).—XXXVI. *Australasian Species.* By Charles P. Alexander, Ph.D., F.E.S., Massachusetts Agricultural College, Amherst, Massachusetts, U.S.A.

In this instalment, additional descriptions of Australian and Tasmanian species of the genus *Molophilus* are given. The majority of these species belong to the *pervagatus* group, the male hypopygium of the typical form (*pervagatus*, Skuse) of which was figured in Part XXXIII. of this series of papers (Ann. & Mag. Nat. Hist. ser. 9, vol. xix. p. 17, 1927). In this group there are three dististyles, the outermost closely adnate to the mesal face of the basistyle, only the distal end being free, the elongate stem reduced to a narrow chitinized strip that extends basad to the level of the point of insertion of the two basal dististyles. The group is peculiar to Australia, where it is represented by numerous, often closely-allied species.

As before, the majority of the species described at this time were collected in Australia and Tasmania by Dr. André L. Tonnoir, to whom the types have been returned. Other material was included in large and valuable collections sent by Dr. E. W. Ferguson, collected by himself and Dr. Mackerras. This material has been returned to Dr. Ferguson. I express my deep thanks to all of these gentlemen for their kind co-operation in this study. I also wish to thank Dr. Mackerras for further notes on certain species that were described from the Skuse collection (*M. gracillimus*, sp. n., and *M. mackerrasi*, sp. n.).

Molophilus picticeps, sp. n.

Belongs to the *pervagatus* group; antennæ of moderate length; head yellow, variegated with dark brown; mesonotal præscutum light reddish brown, the pleura dark brown; knobs of halteres yellow; femora with two dark brown annuli, the outermost terminal in position; fore tibia (♂) with a swollen blackish ring; male hypopygium with the apex of the basistyle unchitinised; outer dististyle simple; basal dististyles simple, elongate, the inner one pale and filiform.

Male.—Length about 3·1 mm.; wing 4·2 mm.

Rostrum dark, the palpi dark brown. Antennæ of moderate length, if bent backwards extending about to the wing-root; basal segment light yellow, the second infuscated; flagellum testaceous, the terminal segments passing into brown; flagellar segments long-oval, clothed with abundant erect silvery verticils. Head yellow, the vertex with an extensive dark brown area in the centre, the broad orbits remaining of the ground-colour.

Lateral pretergites sulphur-yellow. Mesonotum light reddish brown, the præscutum a little darker anteromedially; scutellum and postnotum darker brown. Pleura brown, the dorsal pleurites almost blackish, the ventral pleurites more reddish brown, the junction between the sternopleurite and anepisternum with an obscure yellow spot. Halteres pale, the knobs clothed with pale yellow setæ. Legs with the coxæ and trochanters pale testaceous-yellow; femora yellow, with two brown rings, one apical, the other subequal, slightly paler brown, placed about its own length from the terminal ring; fore tibia (♂) with a subbasal enlarged black annulus; apex of tibiæ and the tarsi brown. Wings with a pale greyish tinge, the base narrowly yellowish; veins slightly darker; macrotrichiæ dark brown, longer and more crowded to form black patches along the anterior and posterior cords, near mid-length of vein *2nd A*, and above this point on veins *M* and *Cu*; wing-axil a little infuscated. Venation: vein *2nd A* of moderate length, extending to just beyond the cephalic end of *m–cu*.

Abdomen brown, the hypopygium more yellowish. Male hypopygium with the basistyles elongate, the outer dististyle lying far distad, the basistyle beyond it restricted, produced mesad into a weak unchitinised beak, this region of the style with numerous erect delicate setæ. Outer dististyle simple, the base broad, the apical portion with a short curved neck, the head oval. Outer basal dististyle a long, simple, gently-curved, black rod that narrows gradually to the acute point, the distal third provided with delicate subappressed setulæ along the outer face; inner basal dististyle only a trifle shorter, very slender and pale, the distal portion almost filiform, the apex very feebly expanded. Tergal plate relatively narrow, setiferous. Ædeagus large and conspicuous.

Hab. Tasmania.

Holotype, ♂, Burnie, October 24, 1922 (*A. Tonnoir*).

Molophilus pictipes, sp. n.

Belongs to the *pervagatus* group; antennæ of moderate length; head dark grey; mesonotum brown; an obscure orange spot on humeral region of præscutum; knobs of halteres yellow; femora yellow with two dark brown annuli, the outermost terminal in position; all tibiæ (♂) with a narrow brown subbasal annulus, that of the fore tibia slightly swollen; male hypopygium with the basal dististyles simple, subequal in size and length, relatively stout.

Male.—Length about 3·8 mm.; wing 4·6 mm.

Rostrum dark, the palpi dark brown. Antennæ of moderate length, if bent backward barely attaining the wing-root; basal segment yellow, the remainder of the organ dark brown; flagellar segments long-oval, with conspicuous erect pale verticils. Head dark grey.

Lateral pretergites narrowly sulphur-yellow. Mesonotal præscutum brown medially, with an obscure orange spot in the humeral region extending cephalad from the pseudosutural foveæ, but not reaching the lateral margin; scutellum and postnotum dark brown. Pleura dark greyish brown, the region between the sternopleurite and anepisternum variegated with obscure yellow. Halteres pale, the knobs yellow. Legs with the coxæ and trochanters obscure yellow, with two dark brown annuli, one apical, the other postmedial, a trifle narrower, the yellow ring between about equal in extent to the darkened tip; tibiæ testaceous, the extreme base more yellowish, the tips narrowly infuscated; all tibiæ with a narrow subbasal brown annulus that is a trifle narrower than the yellow base, that of the fore tibia (♂) a trifle swollen; tarsi brown, the basitarsi more or less brightened basally, especially those of the middle legs. Wings moderately broad, tinged with yellowish; stigmal region infuscated; brown patches of trichiæ on the anterior and posterior cords and near mid-length of vein *2nd A*; prearcular region and the axilla weakly infuscated; veins pale, clothed with conspicuous dark macrotrichiæ. Venation: vein *2nd A* ending just beyond the nearly transverse *m–cu.*

Abdomen brown, the hypopygium paler. Male hypopygium of the same general structure as *M. picticeps*, sp. n. (basistyle not chitinized at apex; outer dististyle simple; both basal dististyles simple, slender, pointed at tips), differing conspicuously in the structure of the styli. Basistyle only vaguely produced at apex, here very densely set with yellow setæ. Outer dististyle with the oval head smaller. Outer basal dististyle rather stout, the surface with triangular appressed denticles on the outer two-thirds, giving the style a feebly roughened appearance; apex stout, but acute; inner basal dististyle subequal in length and only a little more slender, the surface reticulated with elongate-oval plate-like areas, the apex more acute.

Hab. Tasmania.
Holotype, ♂, St. Patrick River, November 4, 1922 (*A. Tonnoir*).

Molophilus gracillimus, sp. n.

Agreeing in the essentials of body-coloration with *M. pulchripes*, Skuse, differing conspicuously in the structure of the male hypopygium.

The following comparative notes on the respective types of *pulchripes* and *gracillimus* were made by Dr. Mackerras: "Scutum yellowish brown; dark brown in *pulchripes*, but this possibly due to the gum. Wing with two well-defined spots, one extending from *r* to the fork *Rs*, the other covering the fork of *M.* These spots are due to black hair. In *pulchripes* the spots are not so clearly defined and tend rather to form a continuous band, the wing being rather rubbed. The swollen dark subbasal band on the fore tibia of *pulchripes* is not represented on any leg in the present species. The femora have a dark brown apical band and a pale yellow to creamy subapical band. The remainder is pale yellowish brown, becoming darker towards the subapical pale band, especially in the mid and hind legs, where the part proximal to the pale band is dark brown, the femur being yellowish brown on its proximal two-thirds, then a fairly broad dark brown band, followed by an equally broad pale band, and finally with a brown apical band equal in width to the others. The legs of *pulchripes* are similar, but the banding is not nearly so prominent, and the darkening proximal to the pale band is only very faintly indicated. Antennæ similar in the two species."

Male hypopygium with the basistyles relatively slender, the restricted apical portion densely setiferous; mesal apical angle further produced into a small blunt fleshy lobe; the entire mesal face of this apical hood-like portion is densely setiferous. Outer diststyle a simple blackened arm, strongly curved to the obtusely rounded apex. Outer basal dististyle a long, nearly straight rod, gently curved beyond the base, a little dilated before the apex, the extreme tip produced into a long, straight, needle-like point; the dilated portion of the style is further roughened, more especially by a series of appressed teeth-like spines on the outer margin before the end, some of the teeth larger and more conspicuous; inner basal dististyle a little shorter than the outer, nearly straight, appearing as a very slender needle-like rod, the surface of the distal fifth indistinctly roughened. Ædeagus straight, shorter than the inner basal dististyle.

Hab. New South Wales.

Holotype, ♂, in the Skuse Collection, Macleay Museum, as paratype No. 1 of *M. pulchripes*, Skuse; "no exact locality data on the pin."—*Mackerras.*

Molophilus eugonia, sp. n.

Belongs to the *pervagatus* group; general coloration dark brown, including the head; basal segment of scape yellow; tips of femora abruptly and conspicuously dark brown; wings greyish, clouded and washed with brown; male hypopygium with the outer dististyle black, truncated at apex; outer basal dististyle a broad flattened black blade that extends into a long point; inner basal dististyle slender, the apex dilated into a small head that is weakly spinulose.

Male.—Length about 4 mm.; wing 5 mm.

Rostrum and palpi dark brown. Antennæ of moderate length, if bent backward extending to beyond the wing-root; basal segment of scape yellow, the remainder of the antenna dark brown; flagellar segments long-oval, with a long erect pubescence and conspicuous verticils. Head brown.

Pronotum brown, narrowly yellowish on either side of the median line. Lateral pretergites bright sulphur-yellow, broader and more conspicuous before the pseudosutural foveæ, thence narrow and inconspicuous back to the wing-root. Mesonotum uniformly dark brown, only the humeral region restrictedly sulphur-yellow; pseudosutural foveæ black; scutum concolorous with the præscutum; scutellum light brown; postnotum dark brown. Pleura uniformly dark brown, the dorso-pleural membrane dusky. Halteres pale at base, the stem a little dusky, the knobs conspicuously light yellow with golden setæ. Legs with the coxæ reddish brown, the fore coxæ darker; trochanters obscure yellow; only a single (posterior) leg remains; femora yellow, a little infuscated subbasally, the tips conspicuously and abruptly dark brown; tibiæ yellow, the tips passing into brown; basitarsi with the proximal half pale, the remainder of the tarsi dark brown. Wings greyish, conspicuously washed and clouded with brown, this including the stigma, wing-tip, cord, a conspicuous transverse wash at level of origin of *Rs*, and a brown cloud at base of cell *2nd A*; the pale ground-colour is thus restricted to a small post-arcular area, with larger discal patches before and beyond the cord; wing-base conspicuously yellowish; veins dark brown, a little paler in the ground-areas, veins Cu_1 and

R_5 somewhat darker; macrotrichiæ conspicuous, dark brown. Venation: *r* lying just proximad of *r–m*, the basal section of R_{2+3} being a little shorter than R_{4+5}; *m–cu* transverse, about one-half the petiole of cell M_1; vein *2nd A* relatively short, ending about opposite the caudal end of *m–cu*.

Abdomen dark brown, including the hypopygium. Male hypopygium with the basistyles relatively short and stout, the apex not conspicuously produced, armed with a dense patch of yellow setæ. Outer dististyle short, heavily blackened, apparently simple, but the apex dilated outwardly and transversely truncated. Outer basal dististyle a broad flattened blade that tapers gradually to a long straight apical spine. Inner basal dististyle shorter and more slender, the apex only slightly dilated into an oval head that is about one-fifth the total length of the style, the base and margins of the head with conspicuous small erect spinules.

Hab. Tasmania.

Holotype, ♂, Hartz Mts., altitude 3000 feet, December 9, 1922 (*A. Tonnoir*).

Molophilus pusio, sp. n.

Belongs to the *pervagatus* group; basal segment of antenna yellow; mesonotum light reddish brown, the postnotum and pleura dark brown, the latter with a more or less distinct longitudinal pale stripe on the sternopleurite: knobs of halteres light yellow; tips of femora narrowly but not very abruptly darkened; male hypopygium with the outer basal dististyle of moderate width; inner basal dististyle slender, the apex spatulate, with a few microscopic spinules along the outer margin.

Male.—Length about 3 mm.; wing 4·2 mm.

Female.—Length about 3·5 mm.; wing 4·6 mm.

Rostrum and palpi brownish black. Antennæ (♂) of moderate length, if bent backward extending almost to the root of the halteres; basal segment of scape conspicuously light yellow; second segment light brown; remainder of antenna dark brown; flagellar segments (♂) elongate-oval, with long conspicuous erect white pubescence. In the female the antennæ are shorter, scarcely attaining the wing-root. Head brown, the front and anterior part of vertex yellowish; in some specimens the posterior orbits are paler.

Pronotum dark, the posterior notum yellow. Lateral pretergites narrowly light sulphur-yellow. Mesonotal præscutum, scutum, and scutellum light chestnut-brown, the humeral triangle yellowish; postnotum dark brown. Pleura dark brown, the sternopleurite with the dorsal portion extensively pale to produce an indistinct longitudinal pale stripe. Halteres pale, the knobs light yellow. Legs with the coxæ yellowish testaceous; trochanters yellow; femora yellow, the tips narrowly darkened; tibiæ brownish yellow, fore tibia (♂) with a narrow subbasal dark ring; tarsal segments passing into dark brown. Wings with a light grey tinge, the cord and a broad subbasal cloud pale brown; wing-tip inconspicuously darkened; wing-base narrowly yellowish; veins darker than the ground-colour, provided with dark macrotrichiæ that are more dense and conspicuous along the cord. Venation: *r* lying just beyond the level of *r–m*; vein *2nd A* ending a short distance beyond the base of the petiole of cell M_3.

Abdomen dark brown, the large male hypopygium paler, with conspicuous black dististyles. Male hypopygium with the basistyles relatively long and slender, the apex pale, truncated, further produced into a small setiferous lobule. Outer dististyle bifid at apex, the largest lobe truncated at tip. Outer basal dististyle a moderately broad blackened blade, curved into a sickle-shaped structure, the tip acute; on lower or cephalic margin before apex with a series of small inconspicuous setulæ. Inner basal dististyle relatively long and slender, only a trifle shorter than the outer, at apex dilated into a small dark spatula that has several microscopic setiferous punctures; the outer margin before the apex with a series of small appressed teeth or spines, the outermost largest and placed before mid-length of the spatula. Ædeagus relatively long and slender, in mounts extending nearly to the end of the basistyle. Ninth tergite small, narrowed to the concave apex, the surface setiferous.

Hab. Victoria.

Holotype, ♂, Sassafras, Dandenong Range, altitude 1000 feet, October 19, 1922 (*A. Tonnoir*).

Allotopotype, ♀.

Paratopotypes, 4 ♂ ♀.

Molophilus hastatus, sp. n.

Belongs to the *pervagatus* group; head dark brown, the posterior orbits paler, more yellowish; mesonotum reddish brown to dark brown, the scutellum more yellowish; femora tipped with brown; wings with a pale yellowish tinge, washed and clouded with brown; male hypopygium with the outer dististyle trilobed; both basal dististyles slender, the outer acute, the inner smaller, dilated into a small spatulate head.

Male.—Length about 3 mm.; wing 4–4·2 mm.

Rostrum and palpi dark brown. Antennæ short, if bent backward not attaining the wing-root; scapal segments a trifle paler than the dark brown flagellum; flagellar segments oval with a short inconspicuous erect pubescence and long conspicuous whorls of verticils. Head dark brown, the posterior orbits paler, more yellowish.

Anterior pronotum dark, the posterior notum yellow. Lateral pretergites narrowly sulphur-yellow. Mesonotum reddish brown to dark brown, in the latter case the humeral region more reddish brown; remainder of mesonotum dark brown, the scutellum behind broadly yellow. Pleura dark brown, the dorsal portion of the sternopleurite with a conspicuous yellow spot, this subobsolete in the Wilmot specimen, the dorso-pleural membrane narrowly light yellow. Halteres pale, the knobs light yellow. Legs with the coxæ and trochanters brownish yellow; femora brownish yellow, the tips conspicuously dark brown, preceded by a subequal light yellow ring; in the Wilmot specimen the femora are brownish yellow with the tips narrowly darkened, gradually so on the fore femora, more abruptly so on the posterior femora; tibiæ brown, fore tibia (♂) with a dilated subbasal ring; tarsi dark brown. Wings with a pale yellowish tinge, slightly washed with pale brown opposite the origin of *Rs*, at the cord, and more broadly at the apex; anal angle darkened; cord and veins *M* and Cu_1 with dense patches of brown macrotrichiæ, elsewhere on the wing these being more sparse but long. Venation: *r* lying a short distance proximad of *r–m*; vein *2nd A* ending about opposite the caudal end of the short transverse *m–cu*.

Abdomen dark brown, the hypopygium paler, the abdomen with conspicuous erect pale yellow setæ. Male hypopygium with the basistyles relatively long and slender, the apex flattened and squarely truncated, fringed with delicate setæ. Outer dististyle with the apex flattened and conspicuously bilobed, with an additional third lobe at the base. Outer basal dististyle a long, slender, nearly straight spine that terminates in an acute point, the lower or cephalic margin with a few delicate setulæ; inner basal dististyle about two-thirds the length of the outer, slender, sinuous, the apex expanded into a small spatula that is provided with a few microscopic setiferous punctures but is not otherwise armed. Ædeagus long, slender, extending caudad almost to the apex of the basistyles, the distal portion notably narrowed.

Hab. Tasmania.

Holotype, ♂, Burnie, October 25, 1922 (*A. Tonnoir*).

Paratopotypes, ♂, January 31, 1923 (*A. Tonnoir*); *paratypes*, ♂, Wilmot, January 8, 1923 (*A. Tonnoir*); ♂, Eaglehawk Neck, Tasman Peninsula, November 17, 1922 (*A. Tonnoir*).

Molophilus setuliferus, sp. n.

Belongs to the *pervagatus* group; antennæ short; head dark brown; mesonotum and pleura dark brown; femora yellow, the tips only vaguely and gradually darkened; wings pale greyish, the cord seamed with darker; male hypopygium with the outer dististyle unequally bifid at apex; outer basal dististyle a long slender spine with a group of delicate erect setulæ before apex; inner basal dististyle dilated at apex into a large spatula.

Male.—Length about 3·3–3·4 mm.; wing 4·4–4·5 mm.

Rostrum and palpi dark brown. Antennæ relatively short, if bent backward extending about to the wing-root; basal segment of scape yellow, the remainder dark brown; flagellar segments long-oval, with a short inconspicuous pubescence and very long conspicuous whorls of verticils. Head dark brown.

Pronotum dark brown. Lateral pretergites light yellow before the level of the pseudosutural foveæ, more infuscated behind. Mesonotum dark brown, the humeral region of the præscutum with a small yellow triangle. Pleura dark brown. Halteres pale yellow, the stem dusky, with dark setæ. Legs with the coxæ brownish testaceous, darker basally; trochanters yellow; femora yellow, slightly and very gradually darkened at the tips, provided with appressed dark setæ; tibiæ brownish yellow, the tips narrowly darkened, fore tibia (♂) with an unusually narrow subbasal dark ring; tarsi testaceous-brown passing into darker brown at tips. Wings with a pale greyish tinge, the cord with a broad, slightly darker seam; a vague brown suffusion across the basal and anal cells; extreme wing-base more yellowish. Venation: *r* lying immediately proximad of *r–m*; vein *2nd A* relatively short, ending immediately before the caudal end of the transverse *m–cu*.

Abdomen dark brown, including the hypopygium. Male hypopygium with the basistyle ending in a flattened setiferous lobe. Outer dististyle bifid at outer end, the chief lobe broad and obtuse, at its base with a small blunt arm. Outer basal dististyle a slender, smooth, curved rod, narrowed to the long, acute, straight apex, before the tip with a linear row of erect straight setulæ; inner basal dististyle slender, at apex dilated into a conspicuous flattened spatula, the margin of the stem before this apex and the surface of the spatula microscopically spinulose, including a large conspicuous appressed spine on the margin of the spatula just beyond the base. Ædeagus relatively long and slender.

Hab. Tasmania.

Holotype, ♂, Mt. Wellington, November 26, 1922 (*A. Tonnoir*).

Paratopotypes, 2 ♂♂, November 24–28, 1922 (*A. Tonnoir*).

Molophilus diversistylus, sp. n.

Belongs to the *pervagatus* group; general coloration of mesonotum varying from light to dark brown, the pleura dark brown; knobs of halteres yellow; male hypopygium with the outer dististyle simple; basal dististyles very unequal in shape and size.

Male.—Length about 3–3·3 mm.; wing 3·7–4·7 mm.

Female.—Length about 3·3 mm.; wing 4 mm.

Rostrum and palpi dark brown. Antennæ short, in the male, if bent backward, extending about to the wing-root; flagellar segments oval; antennæ dark brown throughout. In the female the antennæ are slightly shorter. Head brownish black.

Pronotum obscure brownish yellow, paler laterally. Mesonotum of type male and female light brown, the humeral region and narrow lateral margins of the præscutum yellowish; scutellum and postnotum passing into darker. In the Tasmanian paratypes the præscutum is a much darker brown. Pleura dark brown dorsally, paler ventrally, with a somewhat paler longitudinal stripe between the anepisternum and sternopleurite; in the paratypes, pleura more uniformly dark brown to brownish black. Halteres pale, the knobs conspicuously light yellow. Legs with the coxæ and trochanters obscure yellow; femora pale brown, the tips a little darker; remainder of the legs passing into darker brown; in the paratypes the legs are more uniformly dark brown. Wings greyish subhyaline, variegated with pale brown along the cord and in the basal and anal cells, this infuscation including the stigmal region; veins darker brown, especially Cu_1 and R_5; macrotrichiæ dark brown. Venation: r lying just beyond the level of r–m; petiole of cell M_3 relatively short, ending opposite the caudal end of the nearly transverse m–cu.

Abdomen dark brown to brownish black, including the hypopygium. Male hypopygium with the ninth tergite a rectangular pale plate, slightly narrowed posteriorly, the caudal margin truncated and fringed with long conspicuous setæ. Basistyle produced caudad into a narrow, flattened, dark lobe, the upper surface of which is subglabrous, the margins densely fringed with setæ; outer face of style with sparse strong setæ; dorsal lobe very small. Outer dististyle simple, the apex dilated into an oval head. Outer basal dististyle a long powerful flattened blade that is gently curved, narrowed gradually to the long acute tip; outer margin with conspicuous appressed serrations; viewed from the side this style is seen to be slender, with the stem glabrous, only the apex dilated into a spinulose head, that is further prolonged into the apical spine described. In a position of rest, this style is directed caudad, the long apical beak strongly dorsad. Inner basal dististyle not more than half the length and much more slender than the outer style, a simple smooth gently sinuous rod, the apex obtuse. In a position of rest, this style is directed caudad. Ovipositor with the valves relatively slender; tergal valves yellowish horn-colour, gently curved to the acute tips.

Hab. Victoria, Tasmania.

Holotype, ♂, Sassafras, Dandenong Range, Victoria, altitude 1000 feet, October 21, 1922 (*A. Tonnoir*).

Allotopotype, ♀, in copula and pinned with type.

Paratypes, ♂, King River, Tasmania, February 4, 1923 (*A. Tonnoir*); ♂, National Park, Tasmania, December 15, 1922 (*A. Tonnoir*); ♂, Mt. Wellington, November 30, 1922 (*A. Tonnoir*); ♂, Fern Tree, Mt. Wellington, November 12, 1922 (*A. Tonnoir*); ♂, Eaglehawk Neck, Tasman Peninsula, Tasmania, November 18, 1922 (*A. Tonnoir*).

The thoracic coloration of the Victoria types is very different from the Tasmanian paratypes, but I cannot detect any correlated structural differences, and must consider them as being identical.

Molophilus flexilis, sp. n.

Belongs to the *pervagatus* group; general coloration greyish brown, the head grey; knobs of halteres somewhat darkened; wings narrow, pale yellow, washed with pale brown; male hypopygium with the two basal dististyles both acute at tips.

Male.—Length 2·6–3 mm.; wing 3·2–3·8 mm.

Female.—Length about 3 mm.; wing about 3·8 mm.

Rostrum and palpi dark brown. Antennæ of moderate length, if bent backward extending about to the wing-root;

scalpal segments obscure ochreous; flagellum brown, the segments oval with a short sparse pubescence and conspicuous dark verticils, these longer than the segments. Head light grey.

Pronotum ochreous. Lateral pretergites narrowly light yellow. Mesonotum greyish brown, the humeral region scarcely or only restrictedly brightened; pseudosutural foveæ narrow, blackened; scutellum paler. Pleura dark brown, sparsely pruinose. Halteres pale, the knobs faintly darkened, with pale setæ. Legs with the coxæ testaceous, darker basally; trochanters testaceous; femora pale brown, paler basally, the tips darkened; tibiæ pale brown, the tips narrowly darker; fore tibia (♂) narrowly darkened, but scarcely enlarged at base; tarsi dark brown. Wings relatively narrow, pale yellowish, the base and costal region brighter yellow; indistinct brown washes along the cord and in the bases of cells *Cu*, *1st A*, and *2nd A*; veins brown, those in the flavous areas more yellowish; macrotrichiæ dark brown, forming darker patches in the region of the stigma and along the cord. Venation: *r* approximately equal to *r–m*; vein *2nd A* short, ending some distance before *m–cu*, cell *2nd A* correspondingly narrow, especially on its distal half.

Abdomen dark brown, the genital segment of the female paler. Male hypopygium with the basistyles relatively broad, the apex produced into a weak fleshy lobule that is densely setiferous. Outer dististyle a simple clavate blackened rod. Outer basal dististyle stouter, a long, nearly straight rod, the tip acute, the distal half darkened and provided with microscopic appressed spinules and smaller setulæ. Inner basal dististyle smaller, appearing as a broadly flattened blade, beyond mid-length narrowed to a slender acute point. Ædeagus only a little longer than the outer basal dististyle. Ovipositor with the valves long, horn-coloured, almost straight, the tips acute.

Hab. Tasmania.

Holotype, ♂, Hobart, November 8, 1922 (*A. Tonnoir*).

Allotopotype, ♀, Launceston, October 29, 1922 (*A. Tonnoir*).

Paratypes, 1 ♂, in copula and pinned with the allotype; 3 ♂ ♂, Burnie, October 25, 1922, and January 31, 1923 (*A. Tonnoir*).

Molophilus trianguliferus, sp. n.

Belongs to the *pervagatus* group; antennæ dark throughout; head dark brown; mesonotum reddish brown; the postnotum and pleura dark brown; femora with the distal half darkened; wings with a pale brown tinge, variegated with darker seams; vein *2nd A* relatively short; male hypopygium with the head of the outer dististyle large, triangular, glabrous; outer basal dististyle a strongly curved blackened rod, with a few microscopic setulæ on outer face before apex; inner basal dististyle a little shorter and stouter, almost straight, dilated at apex into a small elongate head.

Male.—Length about 2·8 mm.; wing 3·5 mm.

Female.—Length about 2·7 mm.; wing about 3·2 mm.

Rostrum and palpi brownish black. Antennæ short, if bent backward not extending beyond the wing-root; brownish black throughout; flagellar segments oval with long conspicuous verticils. Head dark brown.

Mesonotum reddish brown, the median area of the præscutum broadly darker, the lateral margins slightly brighter, including a small obscure yellow mark at the humeral angle; scutum and scutellum dark reddish brown; postnotum dark brown. Pleura dark brown, somewhat paler in the allotype and paratypes. Halteres pale yellow. Legs with the coxæ and trochanters yellowish testaceous; femora brown, the distal half somewhat darker than the base, but the apex not conspicuously darkened; tibiæ and tarsi dark brown; fore tibia (♂) extensively dilated near base. Wings with a pale brown tinge, the stigma, cord, a seam along vein Cu_1 and the base of cell *2nd A* with a somewhat darker tinge; wing-base narrowly yellowish; veins darker brown, the trichiæ almost black. Venation: *r* lying proximad of *r–m*, the basal section of R_{2+3} only about two-thirds the length of R_{4+5}; vein *2nd A* relatively short, ending just before the caudal end of *m–cu*.

Abdomen dark brown, including the hypopygium. Male hypopygium with the basistyles relatively slender, narrowed to the apex, the mesal face at apex with a group of conspicuous yellow setæ; outer face of style with conspicuous larger setæ. Outer dististyle dilated at apex into a large, glabrous, triangular head, the neck short. Outer basal dististyle a slender chitinized rod, strongly curved to the acute apex; a few very short setulæ on outer face shortly before the tip. Inner basal dististyle nearly as long as the outer, stout, at apex dilated into a small elongate head, which is sparsely microscopically spinulose and provided with a few setæ at the apex. Ædeagus sinuous. Ovipositor with long slender valves.

Hab. New South Wales.

Holotype, ♂, Wentworth Falls, Blue Mts., altitude 2844 feet, November 8, 1921 (*A. Tonnoir*).

Allotype, ♀, Narara, November 3, 1921 (*A. Tonnoir*).

Paratypes, 2 ♂♂, with the allotype, November 3–6, 1921; 1 ♂, French's Forest, near Sydney, July 15, 1923 (*I. M. Mackerras*); 1 ♂, Sydney, October 14, 1923 (*E. W. Ferguson*); No. 71.

Molophilus incomptus, sp. n.

Belongs to the *pervagatus* group; basal segment of antenna obscure ochreous; anterior mesonotum light brown, the postnotum and pleura darker; halteres yellow; legs brown, unvariegated; wings grey with a dense grouping of macrotrichiæ along the cord; male hypopygium with the outer dististyle bilobed at apex; outer basal dististyle nearly straight, the base expanded.

Male.—Length about 3·5 mm.; wing 4·3–4·5 mm.

Rostrum and palpi dark brown. Antennæ relatively short, if bent backward extending about to the wing-root; basal segment of the scape obscure ochreous; remainder of antenna dark brown; flagellar segments oval with a dense erect white pubescence and unilaterally arranged verticils. Head dark brown, the anterior part of the vertex and the orbits vaguely more ochreous.

Pronotum ochraceous testaceous, with very long setæ. Lateral pretergites narrowly sulphur-yellow, brighter and more conspicuous anteriorly. Mesonotum dull light brown, with conspicuous erect black setæ; præscutum with the humeral region obscure yellow; scutellum brownish testaceous; postnotum darker brown. Pleura darker brown. Halteres pale, the knobs light yellow, with silken setæ. Legs with the coxæ and trochanters yellowish testaceous; femora light brown, unvariegated; tibiæ light brown, fore tibia (♂) with a dilated, slightly darkened, subbasal ring; tarsi passing into brown at tips. Wings moderately broad, tinged with grey; veins slightly darker; the macrotrichiæ dark brown, conspicuous, forming a darker cloud along the cord; veins Cu_1 and Anals with similar dark patches. Venation: *r* lying beyond the level of *r–m*, the basal deflection of R_{2+3} being longer than R_{4+5}; vein *2nd A* of moderate length, ending just beyond the origin of the petiole of cell M_3.

Abdomen dark brown, conspicuously clothed with erect pale setæ; hypopygium a little brighter brown. Male hypopygium with the basistyles relatively slender, the apex with the oblique mesal face with dense yellow setæ. Outer dististyle with the dilated apical portion trifid, the apex being bilobed, with a basal triangular tooth separated from the apex by a deep U-shaped notch. The two basal dististyles appear to be reversed in position to what is normal in the *pervagatus* group, the outer or more lateral one being a little shorter and stouter, narrowest near mid-length, the relatively small apex with microscopic appressed spinulæ. Inner basal dististyle a slender, nearly straight rod from a dilated yellow base, the stem narrow, thence slightly dilated, the long black apex acute. Ædeagus very long and slender, in slide-mounts extending caudad to opposite the tips of the basistyles.

Hab. New South Wales.

Holotype, ♂, Wentworth Falls, Blue Mts., altitude 2844 feet, November 18, 1921 (*A. Tonnoir*).

Paratopotype, ♂.

Molophilus micropteryx, sp. n.

General coloration dark grey; halteres very small; wings subatrophied, less than 1 mm. long.

Female.—Length about 2·8 mm.; wing 0·8 mm.

Rostrum and palpi black. Antennæ of moderate length, black throughout, provided with conspicuous verticils. Head grey.

Thorax entirely dark grey. Halteres pale brown, very small, the heads feebly dilated. Legs relatively short and stout; coxæ brownish black; trochanters brown; remainder of legs dark brown. Wings (of ♀, at least) very reduced, if bent backward not extending beyond the second abdominal segment, with a pale brown tinge, the base more yellowish; veins darker brown, stout. Venation distorted, but evident; cell R_3 barely sessile; vein *1st A* ending opposite *m–cu*; vein *2nd A* short.

Abdomen brownish black; basal shield of ovipositor dark, the valves light yellow, the tergal valves more slender, gently upcurved, the tips acute.

Hab. New South Wales.

Holotype, ♀, Wentworth Falls, Blue Mts., altitude 2844 feet, November 18, 1921 (*A. Tonnoir*).

Molophilus micropteryx does not agree with the known males of any of the species described by Skuse or the writer. In its general appearance it agrees most closely with *M. furvus*, Alexander, which is full-winged in both sexes.

Molophilus subapterogyne, sp. n.

Subapterous, at least in the female sex; general coloration testaceous-brown, somewhat shiny; wings subatrophied, less than one-half the length of the body, dimidiate, the distal portion darker than the base; no marginal trichiæ beyond the wing-apex.

Female.—Length about 3 mm.; wing 1·2 mm.

Rostrum and palpi brownish black. Antennæ dark brown. Head dark brown.

Mesonotum dark testaceous-brown, somewhat shiny, the pleura a little paler. Halteres small, pale, the knobs very small. Legs relatively short, brownish yellow, the terminal tarsal segments passing into dark brown. Wings subatrophied (in the ♀, at least), dimidiate, the basal three-fifths grey, the distal two-fifths (beyond the cord) dark brown; costal setæ relatively few and scattered; a row of similar setæ along vein R_1 for its entire length; costal fringe ending at the wing-apex, the margin beyond vein R_5 entirely naked; veins very indistinct and ill-defined.

Abdomen dark brown, the genital segment ochreous, the valves of the ovipositor long but relatively stout, the tergal valves more slender, gently upcurved to the acute tips.

Hab. Tasmania.

Holotype, ♀, Cradle Valley, altitude 3500 feet, January 23, 1923 (*A. Tonnoir*).

Paratopotype, ♀.

I cannot reconcile this species with any males known from Tasmania of which the female sex is not known. The fly resembles *M. micropteryx*, sp. n., in its subapterous condition, differing in the body- and wing-coloration and in the slightly longer wings.

Molophilus indivisus, sp. n.

Belongs to the *plagiatus* group, allied to *M. flavonotatus*, Skuse; basal dististyle of male hypopygium a long cylindrical rod, not dilated near mid-length, but here armed with a conspicuous lateral spine; apex of style simple, curved, heavily blackened for a short distance back from the tip.

Male.—Length about 3·5 mm; wing 4·5 mm.

Generally similar to *M. flavonotatus*, Skuse, differing conspicuously in the structure of the male hypopygium.

General coloration of thorax grey, the lateral pretergites narrowly sulphur-yellow, the præscutum with three confluent brown stripes; pseudosutural foveæ conspicuous, dark brown; scutal lobes brown, the median region grey; scutellum dark brown, the caudal margin inconspicuously paler; postnotum dark brown, the anterior lateral angles of the mediotergite paler. Pleura grey. Halteres pale. Legs with the coxæ and trochanters brownish yellow; femora dark brown, their bases more yellowish; remainder of the legs dark brown; fore tibia (♂) with an enlarged subbasal brownish-black ring. Wings subhyaline, the brown spot in the base of cell *Sc* well-defined; veins darker brown.

Male hypopygium brownish yellow, the basistyles more suffused with brown. Dorsal lobe of basistyle dusky in colour, unarmed with a spine; apical spine of ventral lobe of basistyle long and slender. Outer dististyle slender, the arms long; outer arm expanded into a spatula, the inner arm slender, blackened. Basal dististyle a slender, cylindrical, sinuous rod, near mid-length bearing a single strong black spine, the apical portion beyond this curved to the simple acute black apex. Ædeagus short, ending about opposite the spine of the basal dististyle.

Hab. New South Wales.

Holotype, ♂, Sydney, September 14, 1923 (*E. W. Ferguson*); No. 69.

Paratype, ♂, in the Skuse Collection as paratype No. 1 of the type-series of *M. canus*, Skuse; no exact locality-data.—*Mackerras.*

Molophilus mackerrasi, sp. n.

Belongs to the *plagiatus* group; legs banded quite as in *M. annulipes*, Skuse; wings narrow, yellowish, with no dark spot in the base of cell *Sc*; male hypopygium with the basal dististyle a short powerful rod, the dilated head terminating in two powerful black spines.

Although confused by Skuse with his species *annulipes*, the present form does not even belong to the same subgroup, but is more correctly referable to the typical division of the *plagiatus* group.

The following comparative notes on the two types of *mackerrasi* and *M. annulipes*, Skuse, are kindly supplied by Dr. Mackerras: " *M. mackerrasi.*—Legs not differing appreciably from those of *annulipes*. Wings narrow and yellowish; no dark spot in cell *Sc*. Antennæ uniformly greyish yellow. *M. annulipes.*—Wings rather broad, clear, the spot in cell *Sc* well-marked. Antennæ very pale, with narrow black bands at the constrictions between the segments, a very striking feature."

Male hypopygium with the apical beak of the basistyle blackened, relatively large, the apex subacute, the base of the beak surrounded by numerous setæ. Outer dististyle pale basally, the stem sinuous, the two arms unequal, the lateral arm much larger than the mesal arm, directed mesad, both arms of the style blackened. Basal dististyle a short and very powerful rod, the stem short, soon dilated into a head that terminates in two powerful black spines, the mesal spine lying along the axis of the style, gently curved, the lateral spine nearly straight, directed mesad and lying transversely across the end of the style. Ædeagus relatively long and slender, considerably longer than the basal dististyle.

Hab. New South Wales.

Holotype, ♂, in the Skuse Collection, as paratype No. 2 of the type-series of *M. annulipes*, Skuse; Hogan's Brush, August.—*Mackerras.*

This very distinct fly is named in honour of Dr. Ian Mackerras, to whom I am vastly indebted for co-operation in making known the identities of the numerous species of *Molophilus* described in 1889 by Skuse.

Molophilus inæquidens, sp. n.

Belongs to the *plagiatus* group; general coloration rich brown, the lateral pretergites conspicuously light sulphur-yellow; legs dark brown; wings greyish subhyaline; vein *2nd A* short; male hypopygium with the outer arm of the outer dististyle sinuous, acutely pointed; basal dististyle a short, straight, flattened blade, terminating in two unequal teeth.

Male.—Length, when entire, probably about 3 mm.; wing about 3·8 mm.

Head of the type destroyed by Psocids.

Lateral pretergites conspicuously light sulphur-yellow, the colour extending caudad to the wing-root. Mesonotal præscutum and scutum rich brown, the humeral region of the former paler; scutellum and postnotum vaguely darker brown, slightly pruinose. Pleura dark. Halteres broken. Legs with the coxæ and trochanters brownish testaceous; remainder of legs dark brownish black, the femoral bases only vaguely brightened; fore tibiæ (♂) with a subbasal black ring. Wings greyish subhyaline, the veins darker. Venation: vein *2nd A* short, ending before the level of *m-cu*.

Abdomen destroyed by Psocids, only the hypopygium remaining, this brownish yellow in colour. Apical spine of basistyle short and moderately stout, heavily blackened. Outer dististyle slender, the two arms very unequal, the outer more than twice the length of the inner, sinuous to the acute point; inner arm stout, straight, both arms blackened. Basal dististyle a short straight flattened blade, the apex bifid, the two teeth straight but very unequal, the outer much larger; besides these two primary teeth, there are a few microscopic spines on the blackened distal third; the basal style is distinctly shorter than the outer dististyle. Ædeagus relatively short, the straight apical portion about as long as the basal dististyle.

Hab. New South Wales.

Holotype, ♂, Sydney, September 2, 1923 (*E. W. Ferguson*); No. 73.

Molophilus arcanus, sp. n.

Belongs to the *plagiatus* group; mesonotum light reddish brown; the pleura yellowish testaceous with a broad brown dorsal longitudinal stripe; knobs of halteres infuscated; male hypopygium with the apical beak of the basistyle microscopic; outer dististyle with the stem stout, the two arms blackened; basal dististyle a small slender rod that is about one-third the length of the ædeagus.

Male.—Length about 4 mm.; wing 5·5 mm.

Rostrum and palpi dark brown. Antennæ brown throughout, of moderate length, if bent backward extending to a short distance beyond the wing-root; flagellar segments long-oval, with conspicuous verticils. Head dark brown.

Mesonotal præscutum light reddish brown, the posterior sclerites of the notum somewhat darker. Pleura yellowish testaceous, with a conspicuous broad dorso-longitudinal brown stripe, extending from the propleura, passing caudad above the root of the halteres to the abdomen. Halteres narrowly pale basally, the stem and knobs dark brown. Legs with the coxæ and trochanters yellowish testaceous; femora pale brownish testaceous, with sparse appressed darker setæ; tibiæ and tarsi pale, the terminal tarsal segments darker; middle tarsi a little longer than the tibiæ; hind tarsi shorter than the tibiæ. The fore legs of the unique type are broken, and it cannot be stated whether there is a sexual ring on the tibiæ. Wings with a faint yellowish tinge, the veins pale brown; macrotrichiæ relatively short and sparse, brown. Venation: basal section of R_{2+3} a trifle longer than R_{4+5}; vein *2nd A* relatively short, ending about opposite the caudal end of *m–cu*.

Abdomen dark brown, the hypopygium a very little brighter. Male hypopygium with the ventral lobes of the basistyles produced, as in the group, terminating in a tiny feebly chitinized beak, the integument surrounding this beak with abundant yellow setæ. Outer dististyle very large and powerful, the stem short and broad, the arms large, blackened, both truncated. Basal dististyle very small, shorter than the stem of the outer dististyle, a feebly chitinized rod that gradually narrows to the slender tip, the surface and apex feebly tuberculate. Ædeagus relatively long, moderately stout, approximately three times as long as the basal dististyle.

Hab. Tasmania.

Holotype, ♂, Mt. Wellington, November 25, 1922 (*A. Tonnoir*).

LII.—*Descriptions of Three new Species of Gall-Mites* (Eriophyidæ) *from Sudan.* By A. M. MASSEE, F.E.S., East Malling Research Station.

THESE notes are the result of the examination of a small collection of galls, preserved in spirit, which were forwarded to East Malling Research Station by Dr. G. A. K. Marshall, Director of the Imperial Bureau of Entomology.

Although it is indeed very difficult to study these minute animals when they have been preserved in spirit for any length of time, it has been possible to describe accurately and name three species, all belonging to the well-known genus *Eriophyes*.

In one of the vials containing *Eriophyes balanites*, sp. n., an inquiline belonging to the genus *Phyllocoptes* was found to be present in small numbers. Unfortunately, it has not been possible to describe this species, owing to the lack of material, but it is hoped to procure further material in order that this species may be described at a later date.

The writer is indebted to Dr. G. A. K. Marshall for much valuable assistance.

Eriophyes balanites, sp. n.

Body moderately large, drawn-out, cylindrical. Nymphal stages worm-shaped. Thoracic shield semicircular, non-projecting to a marked extent over rostrum, 36 μ in breadth. Shield ornamented with longitudinal furrows, the three central furrows being nearly straight, conspicuous. Furrows at lateral margins not conspicuous, numerous, branched.

One pair of thoracic bristles is situated at posterior margin of shield, placed midway between central furrow and lateral margins of shield, not widely separated. The bristles are conspicuous and pointed backwards, noticeably tapering towards apex; 30 μ long. Warts of thoracic bristles prominent.

Rostrum short, weak, 20 μ long.

Legs short, small. First pair 38 μ long; fourth and fifth joints 8 μ long, blunt, not quite as long as claw. Second pair about same length as first pair; fourth and fifth joints a little shorter. Leg-bristles weak. Feathered claw 5-rayed, delicate; claws of second pair of legs 9 μ long, claws of first pair a little shorter.

Sternal ledge simple, short. First pair of coxal bristles small, inconspicuous, situated in line with the anterior edge of sternal ledge; second pair just below centre of ledge, 20 μ long; third pair 28 μ long, stout, tapering, situated just above inner coxal angle.

Abdomen marked with about seventy-two rings; body very strongly punctuated; punctuation very fine; rings equidistant. Lateral bristles 18 μ long, slender, situated a little below posterior margin of epigynium; first pair of ventral bristles 50 μ long; second pair 10 μ long; third pair 24 μ long, stout, hair-like. Anal lobe small, not well defined. Caudal bristles 80 μ long, hair-like at apex. Accessory bristles stiff, conspicuous; 8 μ long. Epigynium flat, 24 μ broad. Cover-flap marked with longitudinal straight lines. Genital bristles directed downwards towards anal lobe, situated at base near lateral margins; 30 μ long.

♀ 250 μ long, 45 μ broad; ♂ 190 μ long, 28 μ broad.

Producing numerous pear-shaped cephaloneon galls on upper surfaces of leaves of *Balanites ægyptiaca*, Del., and also causing leaf-curling.

Collected by Mr. W. P. L. Cameron, Gezira Research Farm, Wad Medani, Blue Nile Province, Sudan, 18. ix. 1926.

Eriophyes cernuus, sp. n.

Body cylindrical, drawn-out, sharply tapering at anal end. Nymphal stages compact, not drawn-out. Thoracic shield semicircular, partly extended over rostrum. Shield ornamented with a series of longitudinal furrows, which are more conspicuous at and near the lateral margin.

Thoracic bristles 20 μ long, situated near posterior margin of shield, 18 μ apart, directed backwards; warts of bristles not conspicuous.

Rostrum strong, curved, 20 μ long.

Legs short, spindle-shaped. First pair 32 μ long; fourth and fifth joints 10 μ long, a little longer than claw. Second pair 30 μ long; fourth and fifth joints not quite so long as in first pair. Leg-bristles strong. Feathered claw 5-rayed, 6 μ long, strong. Claws of first and second pair of legs similar, 7 μ long. Sternal ledge simple, short. The first pair of coxal bristles short and frail, situated in line with anterior end of sternal ledge. The second pair short and placed just above the basal end of sternal ledge. The third pair directly in line with the inner coxal angle, 25 μ long, tapering towards apex.

Abdomen marked with about seventy-two rings. Body strongly punctuated. Lateral bristles 10 μ long, weak, placed in line with posterior margin of epigynium. First pair of ventral bristles 50 μ long; second pair 14 μ long; and third pair 20 μ long; strong, tapering, hair-like at apex. Anal lobe small, not prominent. Caudal bristles 70 μ long, very fine and frail. Accessory bristles absent. Epigynium pouch-shaped, 20 μ broad. Cover-flap smooth. Genital bristles directed downwards, towards anal lobe, 27 μ long.

♀ 205 μ long, 38 μ broad; ♂ not known.

Producing oak-apple-like galls on new growths of "sidr" (*Zizyphus*), and also malformation of buds.

Collected by Mr. W. L. P. Cameron, Gezira Research Farm, Wad Medani, Blue Nile Province, Sudan, 30. x. 1926.

Eriophyes luridus, sp. n.

Body cylindrical, stout, slightly tapering towards anal end. Thoracic shield semicircular, projecting over rostrum, 40 μ in breadth. Shield ornamented with indistinct longitudinal furrows at and near lateral margins. Central portion of shield smooth.

Thoracic bristles situated at posterior margin of thoracic shield, widely separated, at lateral margins. These bristles are conspicuous and are directed backwards; not noticeably tapering towards apex. Warts of thoracic bristles prominent.

Rostrum very short, straight, 14 μ long.

Legs short, frail. First pair 34 μ long; fourth and fifth joints 6 μ long, weak and frail as compared with claw. Second pair 30 μ long; fourth and fifth joints same length as in first pair. Leg-bristles weak. Feathered claw 4-rayed, very delicate; claws of first and second pair of legs 8 μ long.

Sternal ledge simple, short. First pair of coxal bristles short, not conspicuous, in line with anterior end of sternal ledge; second pair in line with posterior end of sternal ledge, a little longer and more conspicuous than first pair; third pair prominent, situated in line with inner coxal angle, 25 μ long.

Abdomen marked with about fifty-two rings; body very sparsely and inconspicuously punctuated. Lateral bristles 16 μ long, fine, delicate; first pair of ventral bristles 60 μ long, frail and slender, warts prominent; second pair 20 μ long, stiff; third pair 20 μ long, tapering, hair-like towards apex. Anal lobe small, smooth. Caudal bristles not very stout or strong, 50 μ long. Accessory bristles absent. Epigynium raised, 18 μ broad. Cover-flap smooth. Genital bristles conspicuous, curved, and directed towards anal lobe, 30 μ long.

♀ 200 μ long, 40 μ broad; ♂ not known.

Producing large, irregular, knot-like galls on shoots of "sidr" (*Zizyphus*), and also malformation of buds.

Collected by Mr. W. L. P. Cameron, Gezira Research Farm, Soba, Blue Nile, Sudan, 28. ix. 1926.

LIII.—*A Contribution to the Knowledge of the Species of Gall-Mites* (Eriophyidæ) *of Sussex.* By A. M. MASSEE, F.E.S., East Malling Research Station.

GALL-MITES have not attracted the attention of naturalists to any great extent in this country, and therefore it is not surprising that the number of recorded species is very small. Moreover, the existing records are of a somewhat doubtful nature, since the mites were generally determined by the appearance of the galls produced by them, and not on the characteristics of the mites themselves.

The following list of species of gall-mites of Sussex is the result of a few days' collecting during the spring of 1926 and in July 1927. The total does not represent the total number that will in all probability be found after continued systematic collecting. It is hoped that further records will be published from time to time.

Finally, it may be stated that all the species recorded below have been identified on the characters of the mites themselves, and not on the form of gall produced by them.

The writer is indebted to Mr. W. Fowle for continued assistance in obtaining many of the specimens.

(1) *Eriophyes albæspinæ*, Cotte, 1912.

Cotte, Rech. Gall. Provence, 1912, p. 72.

On *Cratægus oxyacantha*, L. (hawthorn).
Producing small, inconspicuous, whitish hair-like galls at the angles of veins of under surface of leaves.
West Sussex, July 1927. Not common.

(2) *Eriophyes aucupariæ*, Connold, 1901.

Connold, Brit. Veg. Galls, 1901, p. 124.

On *Pyrus aucuparia*, Gaörtn. (mountain-ash).
Producing conspicuous pustules on both surfaces of leaves.
West Sussex, July 1927. Rare.

(3) *Eriophyes avellanæ*, Nal., 1889.

SB. Ak. Wien, 1889, vol. xcviii. p. 126.

On *Corylus avellana*, L. (hazel).
Producing "big-buds."
West Sussex, 1926. Abundant.

(4) *Eriophyes calycobius*, Nal., 1891.

N. Acta Ac. Leop. 1891, vol. lv. p. 367.

On *Cratægus oxyacantha*, L. (hawthorn).
Producing miniature "big-buds," which eventually dry out.
West Sussex, 1927. Common.

(5) *Eriophyes cratægi*, Can., 1890.

Atti Soc. Veneto-Trent. 1890, vol. xii. p. 15.

On *Cratægus oxyacantha*, L. (hawthorn).
Producing raised whitish-yellow blister-galls on both surfaces of leaves.
Leaves badly malformed after severe infestation.
West Sussex, July 1927. Common.

(6) *Eriophyes filiformis*, Nal., 1890.

Anz. Ak. Wien, 1890, vol. xxvii. p. 2.

On *Ulmus campestris*, L. (elm).
Producing slightly raised whitish blisters on both surfaces

of leaves. Mainly on under surface. Brown in colour when old. The gall resembles that produced by the pear-leaf blister-mite.

West Sussex, July 1927. Not common.

(7) *Eriophyes galii* (Karp.), Nal., 1889.

SB. Ak. Wien, 1889, vol. xcviii. p. 142 (*Cecidophyes*).

On *Galium aparine*, L. (goose-grass).

Producing malformed flowers. Also the edges of the leaves are curled and tightly rolled upwards.

East Sussex, May 1926. Common.

(8) *Eriophyes gibbosus*, Nal., 1892.

Anz. Ak. Wien, 1892, vol. ii. p. 179.

On *Rubus fruticosus*, L. (blackberry).

Producing a mosaic-like whitish mottling on upper surface of leaves.

West Sussex, July 1927. Common.

(9) *Eriophyes gracilis*, Nal., 1890.

Anz. Ak. Wien, 1890, vol. xxvii. p. 2.

On *Rubus idæus*, L. (raspberry).

Producing indistinct mottlings on the upper surfaces of the leaves. Minute "nail" galls produced in rare cases.

West Sussex, July 1927. Not common.

(10) *Eriophyes iteinus* (*typicus*), Nal., 1925.

Marcellia, 1925, p. 42.

On *Salix* sp. (willow).

Producing red pouch-galls, which are mainly confined to the upper surfaces of the leaves.

West Sussex, July 1927. Rare.

(11) *Eriophyes macrochelus*, Nal., 1890.

Anz. Ak. Wien, 1890, vol. xxvii. p. 212.

On *Acer campestre*, L. (common maple).

Producing conspicuous reddish galls on upper surfaces of leaves. Gregarious.

West Sussex, May 1926. Common.

(12) *Eriophyes macrorhynchus*, Nal., 1889.

SB. Ak. Wien, 1889, vol. xcviii. p. 137.

On *Acer campestre*, L. (common maple).

Producing small reddish pimple-galls on upper surfaces of leaves. Gregarious.

West Sussex, May 1926. Abundant.

(13) *Eriophyes malinus*, Nal., 1891.

Anz. Ak. Wien, 1891, vol. xxviii. p. 199.

On *Pyrus malus*, L. (apple).

Producing a slight mottling on upper surfaces of leaves.

West Sussex, July 1927. Local.

(14) *Eriophyes phlœocoptes*, Nal., 1890.

Anz. Ak. Wien, 1890, vol. xxvii. p. 2.

On *Prunus spinosa*, L. (sloe).

Producing prominent cephaleon on galls on both surfaces of the leaves. Leaves frequently badly malformed. Mosaic-like mottlings after slight infestations.

West Sussex, July 1927. Not common.

(15) *Eriophyes piri* (Pgst., 1857), Nal., 1890.

Verk. Ver. Heidelb. 1857, vol. i. p. 48; Anz. Ak. Wien, 1889, vol. xxvi. p. 126.

On *Pyrus communis*, L. (pear).

Producing slightly raised blisters on upper surfaces of leaves.

West Sussex, July 1927. Common.

(16) *Eriophyes psilaspis*, Nal., 1893.

Anz. Ak. Wien, 1893, vol. xxx. p. 190.

On *Taxus baccata*, L. (yew).

Producing "big-buds."

West Sussex, May 1926. Common.

(17) *Eriophyes ribis* (Westw., 1869), Nal., 1893.

Gard. Chron. 1869, p. 841; Anz. Ak. Wien, 1893, vol. xxx. p. 105.

On *Ribes nigrum*, L. (black currant).

Producing "big-buds."

West Sussex, May 1926. Common.

(18) *Eriophyes rudis* (*typicus*), Can., 1890.

Atti Soc. Veneto-Trent. 1890, vol. xii. p. 51.

On *Betula alba*, L. (birch).

Producing "big-buds."
West Sussex, July 1927. Not common.

(19) *Eriophyes tristriatus*, var. *erinea*, Nal., 1890.

Anz. Ak. Wien, 1889, vol. xxvi. p. 162.

On *Juglans regia*, L. (walnut).
Producing conspicuous erineum galls on upper surfaces of leaves.
West Sussex, July 1927. Not common.

(20) *Phyllocoptes gymnaspis*, Nal., 1891.

Anz. Ak. Wien, 1891, vol. xxviii. p. 225.

On *Acer campestre*, L. (common maple).
Producing a whitish pubescence at angles of veins on under surfaces of leaves.
West Sussex, July 1927. Not common.

(21) *Phyllocoptes schlechtendali*, Nal., 1890.

Anz. Ak. Wien, 1890, vol. xxvii. p. 2.

On *Pyrus malus*, L. (apple).
Producing a mosaic-like mottling; also curling of leaves.
West Sussex, July 1927. Local.

REFERENCES*.

(1) *Anz. Ak. Wien.* 'Anzeiger der Akademie der Wissenschaften. Mathematisch-naturwissenschaftliche Klasse.' Wien.
(2) *Atti Soc. Veneto-Trent.* 'Atti della Società Veneto-Trentina di Scienze naturali, residente Padova.' Padova.
(3) *Connold, Brit. Veg. Galls.* Connold, Edw. T. 'British Vegetable Galls.' London, 1901.
(4) *Cotte, Rech. Gall. Provence.* Cotte, H. J. "Recherches sur les Galles de Provence." École sup. de Pharmacie, Année 1912–13. n. Tours, 1912.
(5) *Gard. Chron.* 'The Gardener's Chronicle.' London.
(6) *Marcellia.* Marcellia. 'Rivista internazionale di Cecidologia.' Avellino.
(7) *N. Acta Ac. Leop.* "Nova Acta Academiæ Cæsareæ Leopoldino-Carolinæ Germanicæ Naturæ Curiosorum." Verhandlungen der (Kaiserlichen) Leopoldinisch-Carolinischen Akademie der Naturforscher. Norimbergæ.
(8) *SB. Ak. Wien.* 'Sitzungsberichte de Akademie der Wissenschaften. Mathematisch-naturwissenschaftliche Klasse.' Wien.
(9) *Verh. Ver. Heidelb.* 'Verhandlungen des naturwissenschaftlichen Vereines zu Heidelberg.' Heidelberg.

---

* The references in each instance refer to the original description of the species concerned.

LIV.—*Turbellaria from Lake Tanganyika.*

By H. A. Baylis, M.A., D.Sc.

(Published by permission of the Trustees of the British Museum.)

The two forms with which this paper deals were collected by Mr. S. R. B. Pask in Lake Tanganyika during Dr. C. Christy's collecting expedition on behalf of the British Museum (Natural History) in 1926.

Order PLANARIIDEA, Poche, 1926.

Suborder Planariinea, Poche, 1926.

1. *Planaria tanganyikæ*, Laidlaw, 1906.

Proc. Zool. Soc. Lond. 1906, pp. 777–779.

This species, originally described from material collected by Dr. W. A. Cunnington on his Tanganyika expedition of 1904–1905, is abundantly represented among Mr. Pask's collection. It was found by Dr. Cunnington on the under side of stones in shallow water at several localities, including Niamkolo, at the southern end of the lake, and Ndanvie, near the northern end. Mr. Pask's specimens were found in similar situations at Kigoma, towards the northern end, in September, and at Kirando, towards the southern end, in October. Both these localities are on the eastern shore of the lake.

There is apparently considerable variation in colour in this species. Laidlaw describes the colour of the larger specimens as black, while that of the smaller specimens was grey-brown. Mr. Pask notes that there were specimens of various other colours (green, brown, red, etc.). Possibly the colour is to some extent dependent on the food of the animals. In almost all the specimens, both Laidlaw's types and the present material, the "auricles"—a pair of lateral appendages, resembling ears, near the anterior end of the worm—are of a much paler colour than the rest of the body.

Suborder Plagiostominea, Poche, 1926.

2. *Plagiostomum lacustre*, sp. n. (Figs. 1–4.)

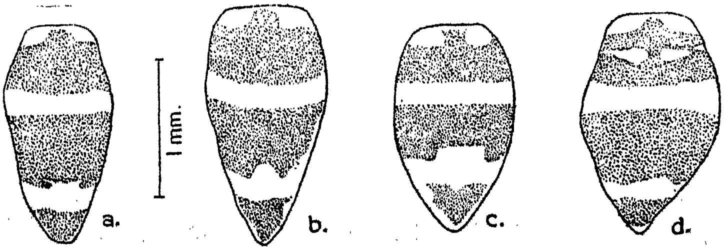
A small species, belonging to the group formerly known as the Allœocœla, was found by Mr. Pask under stones in shallow water near the rocky shore at Kirando at the end of

October. This form is provisionally referred to the genus *Plagiostomum*, Schmidt, 1851, to which it seems to approach most closely in its anatomy, so far as this has been made out.

The animal is roughly ovoid in shape, but the anterior end is broadly truncate, usually with a shallow depression, at the bottom of which is the subterminal mouth. The posterior end is usually bluntly conical. In transverse section the body is circular, or it may sometimes be slightly laterally compressed. In length the worms (in the preserved condition) vary from about 1·4 mm. to 2 mm., and in thickness from 0·9 to 1·2 mm.

There is a definite colour-pattern, due to the presence on the dorsal and lateral surfaces of transverse bands of very dark brown pigment, alternating with narrower interspaces which in the preserved specimens are of a yellowish-buff colour. There are, in all the specimens, three dark transverse bands, which show but little variation in shape and extent. The most anterior of these bands crosses the body a little behind the truncate anterior extremity, sending forward a median dorsal prolongation which passes over the edge of the mouth-depression. The posterior edge of this band is usually quite straight and regular. Occasionally (fig. 1, *d*) there are unpigmented patches in this band, showing a tendency to divide it into two narrower bands. The middle band has a straight anterior edge, but its posterior edge shows a tendency to be indented in the mid-dorsal region, the shape of the pigmented area being here subject to some slight variation (fig. 1, *a*–*d*). The posterior "band" is really a roughly triangular patch of pigment, covering only the dorsal

Fig. 1.

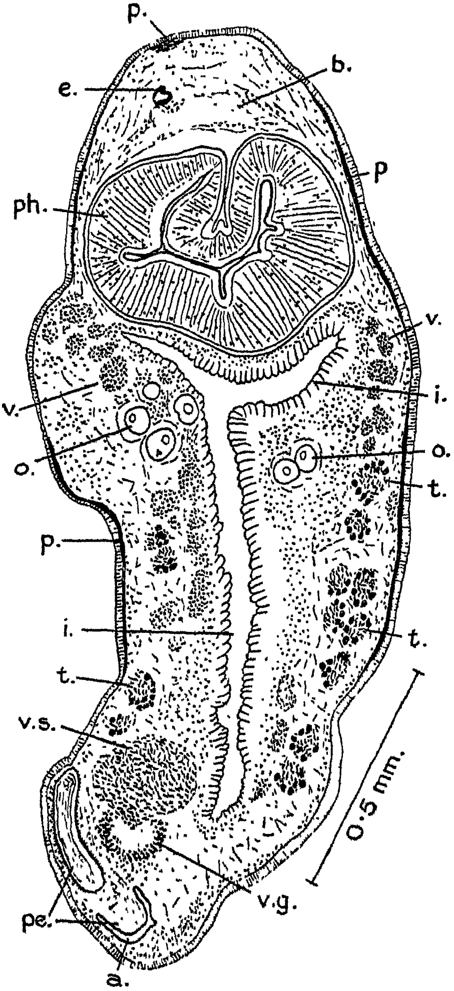


Plagiostomum lacustre, sp. n.

a–*d*, four specimens in dorsal view, showing slight variations in the form of the pigmented bands.

surface, while the other two bands extend on to the flanks of the animal, leaving only the ventral surface entirely unpigmented.

Fig. 2.



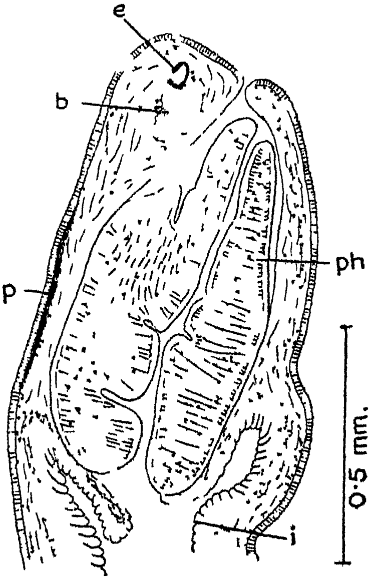
Plagiostomum lacustre, sp. n. Horizontal section (slightly oblique).

a., genital atrium; *b.*, brain; *e.*, eye; *i.*, intestine; *o.*, *o.*, ovaries; *p.*, *p.*, pigment; *pe.*, penis; *ph.*, pharynx; *t.*, *t.*, testes; *v.*, *v.*, vitelline glands; *v.g.*, "vesicula granulorum"; *v.s.*, vesicula seminalis.

There is a pair of eyes (figs. 2 & 3, *e.*) consisting of deeply pigmented cups enclosing hyaline masses, and rather deeply buried in the parenchyme of the anterior end of the body, in close connection with the brain.

Of the internal organs the most conspicuous is the large muscular pharynx (figs. 2 & 3, *ph.*), the edges of which can be protruded through the mouth. Its walls are thick and considerably folded. The pharynx leads into a simple sac-like gut which extends throughout the greater part of the animal's length. The outer limit of the wall of the gut is not very clearly differentiated from the adjacent parenchyme. The animal appears to be of predaceous habits, the entire bodies of small Ostracods having been seen in the gut of several specimens.

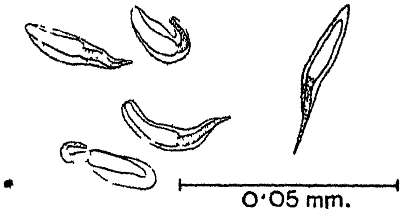
Fig. 3.



Plagiostomum lacustre, sp. n.
Sagittal section of anterior end. Lettering as in fig. 2.

The arrangement of the genital organs is not easily understood. In sections, whether horizontal, sagittal or transverse, the testes and the follicles of the vitelline glands appear to be scattered about among the parenchyme in a quite haphazard manner, and it has not been possible to make out any definitely bilateral arrangement. The ovaries are represented by certain groups of ovarian cells, mainly in front of the middle of the body, at or a little behind the junction of the pharynx and gut. These organs, again, show no definitely paired arrangement, as many as four separate groups of ovarian cells having been seen in a single transverse section. None of these sexual glands are enclosed in definite membranes or clearly limited from the surrounding parenchyme. No uterus or female duct has been made out. (It is, of course, possible that all the specimens, as regards the development of the female organs, are somewhat immature.) The male apparatus is well developed. There is a large spherical vesicula seminalis (fig. 2, *v.s.*), situated in the hinder region of the body. This opens into a rather smaller spherical chamber ("vesicula granulorum") covered externally with deeply-staining cells, and containing granular matter. From this a somewhat coiled duct leads to a large muscular penis (fig. 2, *pe.*), which projects into a genital atrium opening to the exterior by a pore at the extreme posterior end of the body.

Fig. 4.



Plagiostomum lacustre, sp. n.
Spermatozoa, as seen in sections of testis.

The form of the spermatozoa (fig. 4) is perhaps worthy of mention. They are relatively short and stout, consisting of two portions, of which the narrower and more pointed stains with hæmatoxylin, while the stouter and blunter portion stains faintly with erythrosin. The whole has the appearance of being enclosed in a hyaline envelope.

About thirty species of *Plagiostomum* have been described, all of which, with apparently only one exception, are marine. The exception is *P. lemani* (Forel & Duplessis, 1874), which occurs in fresh water in Europe, more especially in the Lake of Geneva and several other Alpine lakes. It is found both in shallow water near the shores of the lakes and also at considerable depths, down to about 300 metres. *P. lemani* is an exceptionally large form, specimens from the Lake of Geneva having been recorded as measuring up to 15 mm. in length. The majority of species are small, measuring from 1 to 5 mm. Assuming that its generic determination is correct, *P. lacustre* is interesting as being a second freshwater representative of a predominantly marine group.

In association with *P. lacustre* were found two species of peculiarly modified water-bugs, representing a new group of Hemiptera Heteroptera, which have been studied and will be described by Professor Teiso Esaki and Mr. W. E. China. In one instance a larva of one of these bugs was found attached to one of the Turbellarians, and had possibly been in the act of preying upon it when collected.

LV.—*Exotic* Muscaridæ (*Diptera*).—XX. By J. R. MALLOCH, Bureau of Biological Survey, Washington, D.C.

Family **Muscidæ**.

Subfamily *MUSCINÆ*.

Genus OCHROMUSCA, nov.

Generic Characters.—Related to *Æthiopiomyia*, Malloch, having the fourth wing-vein with a rounded and conspicuous bend a little beyond middle of its apical section, the apex of first posterior cell being about as wide as length of inner cross-vein, the first vein bare, third setulose at base above and below, the prosternum and pteropleura haired, and the arista plumose. Frons of female about one-third, of male about one-fifth, of the head-width, without forwardly-directed bristles on orbits, the ocellars and postverticals strong; parafacials bare; palpi rather stout. Thorax without presutural acrostichals; centre of propleura, postalar declivity, and ventral surface of scutellum bare; sternopleurals 1+2; hypopleura with fine hairs along anterior and lower side of spiracle, and on lower posterior angle; supraspiracular convexity with erect hairs. Apices of third and fourth tergite and middle of fourth with series of strong bristles. Lower calypter not very large, slightly transverse at apex, and inconspicuously lobed basally on inner margin, lying close to scutellum.

Genotype, the following species.

Ochromusca setigera, sp. n.

Male and *female.*—Ochreous testaceous, slightly shining. Thorax with whitish dust, most distinct between the four reddish dorsal vittæ, the middle of mesonotum with a fuscous vitta anteriorly; a small dark spot above the pleural knob; metanotum fuscous. Abdomen more or less browned or infuscated apically, and with a quite noticeable blackish central spot on second tergite, and sometimes a fainter one on third and fourth. Legs unicolorous testaceous. Wings hyaline, cross-veins faintly clouded.

Third antennal segment about four times as long as second; cheek a little higher than width of third antennal segment; eye in profile about three times as high as long. Thorax with 2+3 dorso-centrals; prealar very short. Abdomen short ovate; fifth sternite of male broad at apex, with a short process on each apical lateral angle and one in middle; hypopygium small. Fore tibia with some short antero-dorsal setulæ and no posterior median bristle; mid-femur at base on ventral surfaces, and mid-tibia near apex on postero-ventral surface, with some long bristly hairs in male, mid-femur in same sex with a series of short stout bristles on apical half of postero-ventral surface, mid-tibia in both sexes with some short posterior bristles; hind femur in male with long hairs as on mid-pair, but without apical postero-ventral bristles, and with some long strong bristles on apical half of antero-ventral surface; hind tibia in both sexes with a few short antero-dorsal and postero-dorsal bristles, and a few fine antero-ventral setulæ. Inner cross-vein close to middle of discal cell and well in front of apex of first vein.

Length 8–9 mm.

Type, male, allotype, two male and one female paratypes, Mgwavuma, Zululand, March 17, Acc. No. 2059 (*E. W. Baxter*).

Type in Durban Museum.

I have included this genus in my key to the genera of Muscidæ of the world now almost ready for the press. I have been unable to find any of the numerous descriptions of Anthomyiidæ by Stein which will fit this species, and consider it as undescribed.

Genus Morellia, Robineau-Desvoidy.

Morellia abdominalis, Stein.

I have recently received from Mr. Alexander Cuthbertson a male of this very fine species, taken at Salisbury, S. Rhodesia. It runs down readily in my key to the species of the genus presented in Part XI. of this series of papers (1923).

There is no indication of the habits of the species except the notation on label, "From long grass in swamp."

Family **Calliphoridæ**.

In the following pages I present some data upon the family Calliphoridæ which may be of use to students of these flies, and especially to those who are interested in the peculiar group sometimes referred to as Muscidæ Testaceæ. Considerable confusion exists in the determination of species in the group, and though I attempt in this paper to readjust matters, I know that this alignment must be tentative, because of the lack of information upon many characters of the previously-described species. The material presented herein must be considered merely as a contribution to the knowledge of the insects dealt with, and subject to investigation by those able to obtain access to the types of the old authors, if such exist.

Subfamily *CALLIPHORINÆ*.

The genus *Kenia* described below is an aberrant form which is placed provisionally in this subfamily, having, in my opinion, more affinities with some of the members of it than with those of any other segregate known to me.

Genus KENIA, nov.

Generic Characters.—Frons of male about one-third of the head-width, each orbit with a series of strong bristles which begin almost opposite apex of second antennal segment, all except the upper one incurved, one forwardly-directed supra-orbital, and many fine hairs which extend downward almost to lower margin of eye; interfrontalia almost bare; ocellar bristles strong, divergent; a pair of short divergent bristles behind ocelli; postverticals short, situated on edge of vertex, subparallel; only the inner vertical bristles strong; centre of occiput bare; arista long, tapered, with some rather short hairs on upper side some distance from base, occupying about one-third of its length, and some much shorter hairs below these; facial ridges haired on lower half; proboscis and palpi normal. Prosternum and centre of propleura haired; sterno-pleurals 1+1; some fine hairs below lower calypter; four bristles on presutural area; presutural and postsutural acrostichals and dorso-centrals distinct; some very fine hairs on the suprasquamal declivity. Abdomen without discal bristles on tergites. Hind tibia with outstanding antero-dorsal and postero-dorsal bristles. Wing-venation as in *Booponus*, Aldrich. Lower calypter widened behind.

Genotype, the following species.

Kenia flavida, sp. n.

Male.—Testaceous-yellow, slightly shining; metanotum fuscous; abdomen with a faintly indicated dark dorso-central vitta anteriorly, most of the apical two tergites and all of hypopygium fuscous.

Head and eye about twice as high as long; parafacial as wide as third antennal segment, the latter about five times as long as second segment, extending almost to lower margin of the deeply concave face; cheek nearly half as high as eye, some of the short fine hairs on upper part black, the others yellow. Thorax with 3+3 acrostichals, 2+4 dorso-centrals, three intra-alars behind suture, and a long prealar; scutellum with eight marginal bristles and two discal preapical bristles; postscutellum slightly developed, but not convexly rounded above; lower stigmatal bristle absent; pteropleura with one black bristle and many fine pale hairs. Apical bristles on abdominal tergites strong. Fore tibia with one posterior and three or four antero-dorsal bristles; tarsal claws rather short; hind tibia with two or three strong antero-dorsal and postero-dorsal bristles and one antero-ventral setula. Inner cross-vein at middle of discal cell; fourth vein with subapical rounded curve; outer cross-vein bent outward above middle.

Length 6 mm.

Type, Kenya Colony, S. Masai Reserve, 11. v. 1913 (*T. J. Anderson*).

This genus is very closely allied to *Booponus*, Aldrich, the larvæ of which infest the hoof of the water-buffalo in the Philippine Islands. The latter genus has the propleura bare in centre, and the hind tibia with a series of short antero-dorsal and postero-dorsal setulæ, only the apical one of the former series strong and outstanding.

There is no record of the larval habits of this genus available.

Genus VERTICIA, nov.

This genus is another which belongs to the same segregate as the preceding one, and is also a difficult one to deal with, though I have more material belonging to it than I have of

Kenia. Both of the genera would undoubtedly fall within the Muscidæ Testaceæ of authors, but they appear to me to be aberrant Calliphorinæ despite their rudimentary post-scutellum. I include within the genus two segregates, one with and one without bristles on the upper surface of the first wing-vein, believing that in the family dealt with this character does not have generic significance.

Generic Characters.—Frons in both sexes wide, in the male about one-third, in the female from two-fifths to one-half, of the head-width, the edge of vertex sharp, because of the head lying close against the front of thorax, and the occiput being slightly concave, much as in Rhiniini, the ocelli removed from vertex, and between them and its edge there is a pair of divergent bristles as long as the ocellars; each orbit with a series on inner marginal bristles, the upper one curved backward, the others curved inward, and on upper half one outer forwardly-directed bristle; parafacials setulose; arista long-haired on upper side, almost on entire length, much shorter-haired below; palpi of average size; facial ridges setulose on lower half.

Thorax with three pairs of presutural acrostichals, the posterior pair close to the suture; prosternum and centre of propleura bare; sterno-pleurals 1 + 1; both propleural and stigmatal bristles present; no hairs on supraspiracular convexity nor postalar declivity, and sometimes a few present below lower calypter, the latter reniform, rounded behind, lobed on inner margin, and wider than long. Second sternite overlapping sides of the tergite; no discal bristles on tergites. First posterior cell ending near wing-tip, narrowly open at apex, fourth wing-vein with a broadly-rounded curve beyond middle of apical section, running close to and parallel with margin of wing from beyond curve; sixth vein traceable to margin of wing. There is a sexual dimorphism in the costal armature, the female having quite conspicuous bristles from base to beyond middle, while the male lacks them.

Kenia, apart from being more slender, is distinguished from this genus by the rounded vertex, lack of concavity of the occiput, and the presence of hairs on the propleura and prosternum; the shorter arista, with its longer hairs, appears also to be a distinguishing character, and the hairs are carried to apex in *Verticia*.

Genotype, *Verticia orientalis*, sp. n.

I have before me what appear to be three species, distinguished as below.

Key to the Species.

1.	First wing-vein with several long bristles on upper side near middle	*orientalis*, sp. n.
	First wing-vein bare on upper side..........	2.
2.	Abdomen practically all black on dorsum	*nigra*, sp. n.
	Abdomen testaceous-yellow, with a narrow black apical fascia on each tergite which is usually narrowly interrupted in middle	*fasciventris*, sp. n.

Verticia orientalis, sp. n.

Male and *female*.—Head testaceous-yellow, frons more brownish, ocellar spot fuscous, third antennal segment browned above, upper occiput infuscated, all cephalic hairs and bristles dark. Thorax testaceous-yellow, mesonotum except lateral margins blackened, disc of scutellum blackened basally, metanotum brown in centre, in the female less evidently darkened. Abdomen testaceous-yellow, shining, with an apical black fascia on all tergites, except the basal one, which is widened in middle, the one on fifth tergite interrupted in middle. Legs testaceous-yellow. Wings greyish hyaline. Calyptræ and halteres yellow.

Frons in male about one-third, in female about two-fifths, of the head-width, about 1·5 as long as wide in male, less elongate in female, interfrontalia smooth and bare, many short setulæ laterad of the orbital bristles, several hairs behind the postocellar bristles, one pair, probably representing the postverticals, close to vertex; third antennal segment fully five times as long as second in male, shorter in female, the arista about as long as third antennal segment, with both long and short hairs above and short hairs below; parafacial narrower in male than in female, in the former with one series of setulose hairs, in the female with several series; facial ridges setulose on lower half of their length; palpi rather stout. Mesonotum not much longer than wide, humerals three or four in number; three or four bristles on presutural area; postalar callosity with three bristles, the middle one much longer than the others; prealar short; lower stigmatal bristle almost or quite indistinguishable from the surrounding hairs; scutellum thin on edge, the hairs extending on sides but not to venter. Bristles at apex of fourth tergite and on sides of apices of other tergites outstanding in male, those on apices of third and fourth tergites in female quite long, but not very strong. Legs rather stout, mid and hind femora (especially in female) noticeably thickened, fore tibia with one posterior and three anterodorsal bristles; mid-tibia in male with one antero-dorsal and about three posterior bristles, that of female with three antero-dorsal, one ventral, and three posterior bristles; hind femur of male with four or five long bristles on apical half of antero-ventral surface and one or two near base on postero-ventral surface, the female with more numerous bristles, and those on anterior and antero-dorsal surfaces apically conspicuous. Inner cross-vein at middle of discal cell, the bristles on first and third veins above long, the latter continued to beyond inner cross-vein, on lower side of third vein confined to extreme base and very short.

Length 6 mm.

Type, male, Kuala Taku, 500 feet, Pahang, Federated Malay States, Dec. 8, 1921; allotype, Batang Padang, Jor Camp, 1800 feet, Perak, F.M.S., Jan. 25, 1925; paratype, male, same locality as type, Dec. 7, 1921 (*H. M. Pendlebury*).

The hypopygium of the male has two pairs of chitinous downwardly-directed processes, one behind the other, the anterior pair shortest, with slightly knobbed apices and connected about one-third from tips, the posterior pair are more parallel-sided and separated to bases, and in addition to these processes there is a rather broad leaf-like plate resembling the processes of the fifth sternite of some Cœnosiinæ on each side, which project straight backward and extend to, or beyond, apex of abdomen, the apices of which are armed with dense black bristly hairs on the outer sides.

Verticia nigra, sp. n.

Female.—Differs from the preceding species in having the dorsum more extensively and intensely blackened, that of abdomen being almost entirely black. Structurally there is very little difference between this species and *orientalis*, but the first vein is bare above.

Length 6·5 mm.

Type, Singapore, Straits Settlements (*C. F. Baker*). Paratypes, Bukit Kutu, Selangor, F.M.S., 3500 feet, April 18, 1926, and Kuala Lumpur, Selangor, F.M.S., at light, Jan. 6, 1925 (*H. M. Pendlebury*).

Verticia fasciventris, sp. n.

Female.—Distinguished from the preceding species by the character listed in key, and also by the longer third antennal segment and less strongly bristled hind femora.

Type, Lubok Kedondong, North-west of Mt. Ophir, Federated Malay States, 200 feet, Nov. 1920 (*H. C. Abraham*).

Genus Bengalia, Robineau-Desvoidy.

This genus is one which has caused considerable difference of opinion as to its systematic position and its importance in the classification of the family. I incline to the opinion that it is a member of the Calliphorinæ, and that along with *Auchmeromyia* and one or two other genera it may possibly be accorded tribal rank, but there are, as far as I have been able to detect, no outstanding structural characters for their separation from some genera of Calliphorinæ.

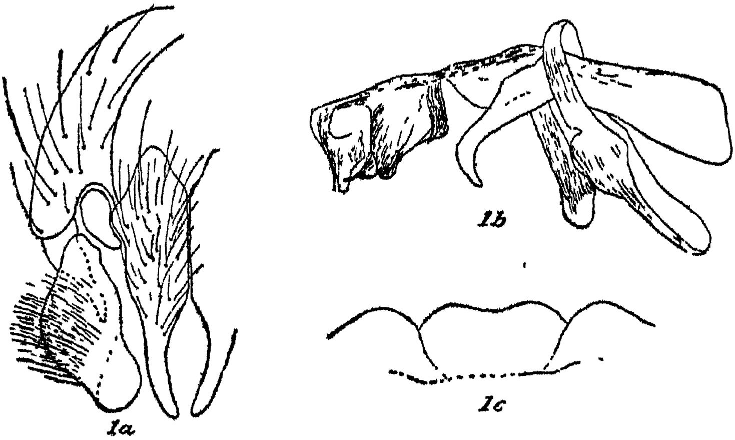


Fig. 1.—*Bengalia labiata*, male. *a*, hypopygium from behind, one side; *b*, internal portions of same from side; *c*, apex of fifth abdominal sternite.

There have been several attempts to elucidate the species of the genus, but unfortunately no author possessed all of the known species. I have carefully gone over all available material, descriptions, and comparative data, have received notes on certain material in the British Museum from Mr. F. W. Edwards, and present herein a summary of my conclusions in so far as these affect species which are now before me. I give some notes on matters affecting some of these under the species concerned.

In 1916 Townsend designated *labiata*, Robineau-Desvoidy, as the genotype of *Bengalia*, but from the time of its original description it has remained unknown. I have before me several specimens which I believe to belong to this species, and present a description below.

The genus may be distinguished from its allies by the very stout proboscis, which is heavily chitinized, rounded below, tapered slightly from base of its apical section to tip, and furnished with two long hairs at base of this section below, and a series of about three long bristly hairs on each side above, the ventral portion appearing bare except under a very high power lens; frons wide and hairy in both sexes; bare supraspiracular convexity; and the presence of but two bristles on the presutural thoracic area. The hypopygial forceps of the males are of moderate length, slender, divided to bases, and a little divergent at apices, and the fifth sternite in same sex is shaped as shown in the figures attached hereto. The hind tibia has no outstanding setulose dorsal ridge, and, especially on apical half, appears almost round in cross-section. *Auchmeromyia* has a very slight dorsal ridge, and the hairs on it are not close together, as in *Phumosia.*

I consider it possible to accept two subgenera in the group of species which in accordance with the above definition would fall in *Bengalia.* One of these would bear the name *Bengalia,* with *labiata,* Robineau-Desvoidy, as genotype, the other would bear the name *Ochromyia,* Macquart, with the genotype *jejuna,* Fabricius. The two subgenera may be distinguished as indicated below.

Synopsis of Subgenera.

A. The small protuberance below and slightly in front of wing close to the mesopleural suture gourd-shaped, with a distinct neck or extension on its lower side; mid-tibia in neither sex with a pronounced ventral submedian bristle; labrum much exserted, semicircular .... *Bengalia,* Robineau-Desvoidy.

AA. The small protuberance below and slightly in front of base of wing rounded, without an evident extension below; mid-tibia in females, and sometimes also in males, with a pronounced ventral bristle near middle; labrum not, or little, exserted .... *Ochromyia,* Macquart.

I note also that in the specimens of *Bengalia* before me there are no hairs on the extreme anterior extremity of the suprasquamal ridge, while in the species of the other subgenus I have examined there are always some hairs present, though they are hard to distinguish unless with a high-power lens and when the wings are spread forward.

Below I present a redescription of the species I accept as *labiata.*

Bengalia (*Bengalia*) *labiata*, Robineau-Desvoidy.

Male and *female*.—Testaceous-yellow, abdomen distinctly shining. Dorsum of thorax blackish centrally, with greyish dusting and traces of four vittæ. Abdomen usually with bluish-black fasciæ on apices of tergites, generally most, or all, of apical three tergites bluish black. A small black spot on pleura below base of wing. Wings hyaline. Halteres yellow.

Frons sparsely haired, in male one-fourth of the head-width, about one-third in the female; head when seen from in front much wider than high, especially in male, seen from the side about twice as high as long; labrum much protruded, semicircular in outline when seen from above; cheek about as high as width of third antennal segment; lunula with a few hairs; ocellar bristles short; each orbit in female with two forwardly-directed bristles above middle; vibrissæ just above level of mouth-margin, separated by about twice as great a distance as either is from eye; arista plumose; palpi rather broad; proboscis thick, the apical portion heavily chitinized and convex below, with two black bristles at base below and three or four on each side above apically. Thorax with 2+4 dorso-centrals, only the two prescutellar pairs long; anterior postsutural intra-alar very short; basal and apical scutellar bristles long, median pair short; sternopleurals 1+1; centre of propleura bare; prosternum, hypopleura, and centre of postalar declivity hairy. Abdomen in male subcylindrical, tapered apically, third and fourth visible tergites each with a few apical bristles; basal sternite hairy; fourth sternite with a pair of long, strong, black apical bristles; fifth sternite as in fig. 1 *c*; in the female the abdomen is broader basally and more tapered apically, and has shorter black bristles on apices of several of the sternites. Male with fine hairs on ventral surfaces of fore femora and tibiæ, the middle of ventral surface of latter with three or four erect stout spines, its antero-dorsal surface with two fine bristles; mid-femur in same sex with a comb-like double series of erect stiff black setulose hairs at apex on postero-ventral surface; mid-tibia with two posterior bristles; hind femur with a few weak preapical antero-ventral bristles and some preapical postero-ventral hairs; hind tibia with two strong antero-dorsal bristles and two or three fine antero-ventral bristles among the fine ventral hairs; female with a strong posterior bristle and no ventral spines on fore tibia, the mid-femur without apical comb, mid-tibia with antero-dorsal bristle, hind tibia without fine hairs, and the preapical postero-dorsal bristle long; hind coxæ haired at apices above in both sexes. Third wing-vein setulose basally.

Length 7–10 mm.

Localities.—Male, Kuala Tahan, Federated Malay States, Nov. 1921; females, Selangor, Kuala Lumpur, two, October 16, 1921 (*H. M. Pendlebury*); one, Perak, Jor Camp, August 24, 1922 (*E. Seimund*); one, Wai Lima, S. Sumatra, 1921 (*Karny and Siebers*).

Bengalia hastativentris, Senior-White, is not a synonym of this species. Only in well-preserved specimens does the grey dust on abdomen give the dark colour a blue shade.

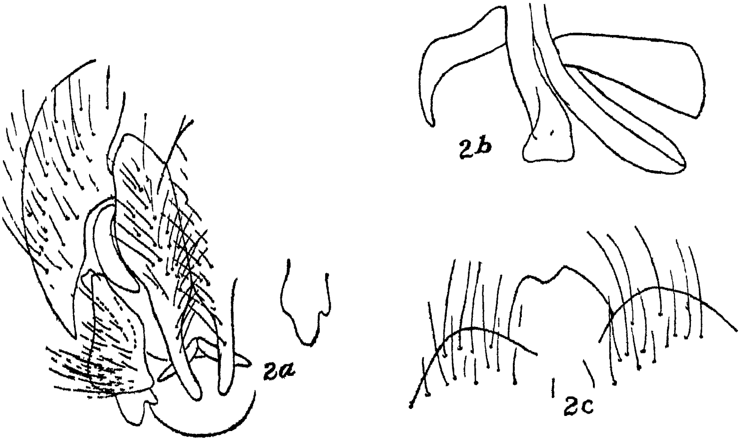


Fig. 2.—*Bengalia hastativentris*, male. *a*, hypopygium from behind, one side; *b*, part of internal portions from side; *c*, apex of fifth sternite.

Bengalia (*Bengalia*) *hastativentris*, Senior-White.

Senior-White failed to associate any species with *labiata*, Robineau-Desvoidy, and described a new one which is very close to the one I accept as *labiata*. Both species have in the male the same type of abdominal armature, the two long ventral bristles being conspicuous in both, and the principal distinctions are found in the hypopygia. I have figured these organs so that it may be possible for students of the genus to distinguish the species. It will be noticed that my figures do not agree entirely with those of *hastativentris* given by Senior-White, but this is merely in detail, the general ensemble being similar, and quite different from that of *labiata*. Viewed from behind the hypopygium of *hastativentris* is seen to have the outer pair of forceps practically truncate at apices (fig. 2*a*), and the inner or superior pair differently shaped. The inner hook is also of different structure (fig. 2*b*), and, though the single male which I have has the central plate of fifth sternite slightly asymmetrical, it would appear to be narrower, longer, and more decidedly emarginate at apex than that of *labiata* (fig. 2*c*). Senior-White does not figure the fifth sternite of this species.

Length 8 mm.

Locality.—Peradenyia, Ceylon, taken pouncing on ants carrying brood (*A. Rutherford*).

The only specimen of this species I have seen is in the United States National Museum.

Whether the three species described by Robineau-Desvoidy are all the same or not can never be settled unless the type-specimens are in existence, and I infer that they are not, as no recent reports that they are have been published, and Surcouf did not have access to them. Possibly the best course would be to accept them as one and the same, and retain the first specific name used for the species included in this paper as *labiata*. If the latter name is dropped as that of an unrecognizable species, we will be faced with the situation of having a genus with an unidentifiable species as genotype, and purists, no doubt, would favour ignoring *Bengalia* altogether.

I consider it highly probable that the three supposed species included under *Bengalia* by Robineau-Desvoidy are one and the same.

Subgenus Ochromyia, Macquart.

Surcouf included in his consideration of *Bengalia* the following species:—*jejuna*, Fabricius, *latro*, de Meijere, *depressa*, Walker, *fuscipennis*, Bezzi, *gaillardi*, Surcouf, and *lateralis*, Macquart. It is to be regretted that when he had access to the type-specimens of the species he did not make a synoptic key for their recognition, as it is still impossible to identify some of the species definitely. Senior-White recently published a paper dealing with the species occurring within the Indian region, and in this and a subsequent paper he has presented figures of the hypopygia and certain other characters of the species known to him. The identity of *jejuna*, Fabricius, is, he points out, a matter of opinion, as the species was described from a female, and no good characters are yet known for the recognition of this sex of several closely-related species which possess no macrochætæ on the fourth visible tergite. He has, however, designated as *jejuna* one of the species occurring in India; in this I am not following him.

An exceptional character in both subgenera is the broad oblong scale-like, or recurved flap-like, expansion of the radial vein at base on its under surface. This same part has been referred to as the subcostal sclerite by Shannon. In this group there are no outstanding hairs on this plate.

I have attempted to identify the fifteen species now in my hands, and present below a key for their recognition which may prove of use to students of the group.

Key to the Species.

1.	Fourth abdominal tergite without distinct bristles on disc	2.
	Fourth abdominal tergite with at least two long strong bristles on disc	13.
2.	Males	3.
	Females	8.
3.	Fore tibia with two separated groups of short stout bristles or spines on ventral surface, usually arranged 3+2, the area between the groups hollowed out; cheek about three times as high as width of third antennal segment, a little more convex than usual, and mostly pale-haired, with a few dark hairs on upper anterior part; fore femur not long-haired on basal half of antero-ventral surface; hypopygium as in figs. 2 *a*, 2 *b*, and 2 *c* .	*lateralis*, Macquart.
	Fore tibia with one series of ventral bristles, usually basad of the middle, and consisting of short stout spines, or with a series of finer bristles, about seven in number, extending over the median third or more of its length, the longest bristle distinctly longer than the tibial diameter.	4.
4.	Apical visible sternite with a long narrow process on each side of the broad central plate at apex (figs. 5 *d*, 6 *f*)	5.
	Apical visible abdominal sternite not noticeably produced each side at base of the central plate at apex	6.
5.	Fore tibia with about seven ventral bristles which are not very stout nor closely placed, one of them about middle of the series much longer than the others and distinctly longer than the tibial diameter; central broad plate at apex of fifth sternite not noticeably concave or emarginate at apex in middle	*siamensis*, Senior-White.

Fore tibia with three or four short, stout, closely-placed, subequal ventral spines before middle; central broad plate at apex of fifth sternite very noticeably concave at apex (fig. 6 *f*) ... . *concava*, sp. n.

6. All pteropleural hairs yellow; mid-femur with from three to six short stout thorns close to apex on postero-ventral surface; posterior inner process of hypopygium with a backwardly-directed point (fig. 7 *c*) .... *recurva*, sp. n.

Some of the pteropleural hairs dark; mid-femur with about a dozen short stout thorns on apical third of postero-ventral surface; posterior inner process of hypopygium without a backwardly-directed point .... 7.

7. Inner apical forceps of hypopygium broad on apical half, rather abruptly pointed (fig. 8 *b*) .... *jejuna*, Fabricius.

Inner apical forceps of hypopygium narrow on apical third or more of their length (fig. 9) .... *xanthopyga*, Senior-White.

8. Outline of hind margin of eye, seen from the side, slightly emarginate at middle (fig. 3 *a*); vibrissæ separated by a distance equal to, or less than, that of either from eye, and at distinctly more than the width of third antennal segment above mouth-margin; parafacial rather broad, with about four series of hairs at level of vibrissæ; cheek over three times as high as width of third antennal segment, the hairs pale below, dark on upper anterior part; third visible abdominal tergite without long suberect bristles on middle of hind margin, usually with a pair of short bristles which are more widely separated than is the case in the other species; pteropleural hairs all pale, those on disc of mesopleura yellow and soft, much shorter than the erect stiff black hairs on upper third........... *lateralis*, Macquart.

Eye not at all emarginate on hind margin (fig. 3 *b*); vibrissæ separated by a distinctly greater distance than either is from eye, and situated usually much closer to mouth-margin than above; parafacial usually becoming quite narrow below, and with less than four series of hairs at lower extremity; cheek not or little over twice as high as width of third antennal segment; third visible abdominal tergite usually with a pair of strong erect rather closely-placed bristles on middle of hind margin, always with these in Oriental species.............. 9.

9. Pteropleural hairs and those surrounding stigmatal bristle all yellow and soft ... *recurva*, sp. n.

At least some of the upper pteropleural hairs dark-coloured .... 10.

10. Pteropleura with a few stout black bristles on upper margin, the fine hairs pale; palpi very slender, but slightly thicker apically, the bristles mostly long and sparse, confined to lower side and apex, grouped slightly at tip, where some of them are rather fine and short, no short stubby bristles on upper side of apical half; labrum not noticeably exserted, upper chitinous portion consisting of a linear rim, which is broadly rounded in outline .... *aliena*, sp. n.

Pteropleura without stout bristles on upper margin, the surface with fine hairs; palpi rather stout .... 11.

11. All of the pteropleural hairs blackish; labrum as in the preceding species, very broadly rounded, and hardly exserted .. *africana*, sp. n.

Most of the pteropleural hairs pale-coloured, some at upper margin blackish; labrum quite conspicuously exserted and triangular or subtriangular in outline .... 12.

12. Abdominal tergites rather narrowly black-margined at apices; hairs surrounding the stigmatal bristle yellow; sides of first tergite not blackened .... *jejuna*, Fabricius.

Abdominal tergites broadly black-margined at apices; hairs surrounding the stigmatal bristle usually fuscous; sides of first tergite broadly blackened behind halteres.......................... *xanthopyga*, Senior-White.

13. Males .... 14.

Females .... 21.

14. Hind tibia with one or more distinct but short postero-dorsal bristles .... 15.

Hind tibia without distinguishable postero-dorsal bristles .... 16.

15. Hypopygium glossy black; fifth abdominal sternite with a slight but distinct V-shaped notch in middle of apical margin (fig. 11 *c*)................... *peuhi*, Brauer & Berg.

Hypopygium testaceous-yellow; fifth abdominal sternite with the apex of central apical plate transverse, without an evident central notch (fig. 10 *c*) .... *minor*, sp. n.

16. Fifth abdominal sternite with a pair of tapered horns in centre of hind margin (fig. 12); hind tibiæ without long ventral hairs .... *spinifemorata*, Villeneuve.

Fifth abdominal sternite without a pair of tapered horns in centre of hind margin; hind tibiæ with long fine black hairs on one of the ventral surfaces .... 17.

17. Hind tibiæ with as long hairs on postero-ventral as on antero-ventral surface.... 18.

Hind tibiæ with long hairs on only the antero-ventral surface apically, the postero-ventral surface with a few much shorter hairs .... 20.

18. Fifth abdominal sternite (fig. 13) without a pronounced central emargination at apex of central plate; fore tibia without ventral bristles .... *inermis*, sp. n.

Fifth abdominal sternite with a deep U-shaped central emargination at apex of central plate .... 19.

19. Apex of central plate of fifth abdominal sternite transverse on each side of the central emargination, the latter occupying about one-third of the apical width (fig. 14) .... *spurca*, Brauer & Bergenstamm.

Apex of central plate sloping diagonally backward from close to each edge of central emargination, the latter occupying almost the entire apical width (fig. 15)....... .... *emarginata*, sp. n.

20. Fifth abdominal sternite with a broad shallow apical emargination of the central plate (fig. 16 *c*); hypopygium as in fig. 16 *a*.......................... *depressa*, Walker (*unicalcarata*, Villeneuve.)

Fifth abdominal sternite without a broad apical central emargination (fig. 17 *c*); hypopygium as in fig. 17 *a*........... *latro*, de Meijere.

21. Hind tibia with one or two distinct postero-dorsal bristles .... *peuhi*, Brauer & Berg.

Hind tibia without distinct postero-dorsal bristles .... 22.

22. Abdominal sternites except the first with very stout spines at apices, those on third to fifth sternites inclusive extending forward along the sides, and there much more numerous than on median portion of hind margin .... *spurca* Brauer & Berg.

Abdominal sternites except the first with a few black bristles on hind margins which are normally stout, none along the sides. 23.

23. The pair of strong bristles on middle of apical margin of third visible tergite separated by a distance not, or very little, more than half as great as that separating the pair of discals of fourth tergite; all the pteropleural hairs yellow .... *spinifemorata*, Villeneuve.

The pair of bristles on middle of apical margin of third visible tergite separated by nearly as great a distance as the pair of discals of fourth tergite; some of the hairs on upper portion of pteropleura blackish .... 24.

24. One bristle at the lateral curve on first and

second visible tergites as strong as the one on fourth at same place; abdomen largely black .... *emarginata*, sp. n.

No strong bristle at lateral curve on either first or second visible tergites as strong as the one on fourth tergite at curve .. 25.

25. A number of the soft hairs above the stigmatal bristle blackish in colour; African species .... *depressa*, Walker.

All the hairs surrounding the stigmatal bristle normally yellow; Oriental species .... *latro*, de Meijere.

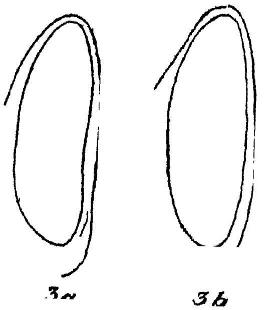
Bengalia (*Ochromyia*) *lateralis*, Macquart.

I accept as this species the one so identified by Surcouf, and in this disagree with Senior-White and Bezzi, both of whom recognized this species as *jejuna*, Fabricius. My reason for this course is that the female specimen of *lateralis* figured by Surcouf and his description of it, in my opinion, fit this species and not *jejuna*, which he also figured and described from the type-specimen. Despite Senior-White's statement that the pair of bristles on apex of third visible tergite are found in all degrees of development, I find that there are always two longer, stronger, and more closely placed bristles on this tergite in *jejuna* than there are in *lateralis*. A point not mentioned by Surcouf nor Senior-White, but listed by Bezzi, under *jejuna*, is that there is quite a conspicuous broad margin of pale dust on each side of mesonotum and also on scutellum, which is most evident when the thorax is seen from behind, and this is not present to any appreciable extent in *jejuna*. I opine that Macquart named this species from this character. In addition to these characters there is a small area round each abdominal spiracle that appears darker than the adjacent parts because of a difference in the dusting, and the apical dark fasciæ on the tergites are narrower in all the specimens of *lateralis* I have seen than in those of *jejuna*.

The stout ventral spines on the fore tibia of the male are usually arranged 3+2, but there is some variation in the numbers, the basal group numbering sometimes five and the apical one sometimes three. Male fifth sternite and hypopygium as in fig. 4.

Length 9·5–13·5 mm.

Fifty specimens, including both sexes, from South India, mostly from Coimbatore, submitted by Y. Ramachandra Rao. Many of the specimens bear the notation "resting on grass." I have before me also one specimen from Jhansi, N.W. India, August 2, 1905, taken on flowers (*Brunetti*). The Coimbatore specimens were taken in February, May, and from August to September. With these records there are left only the months of January, March, and June unaccounted for in the entire year.



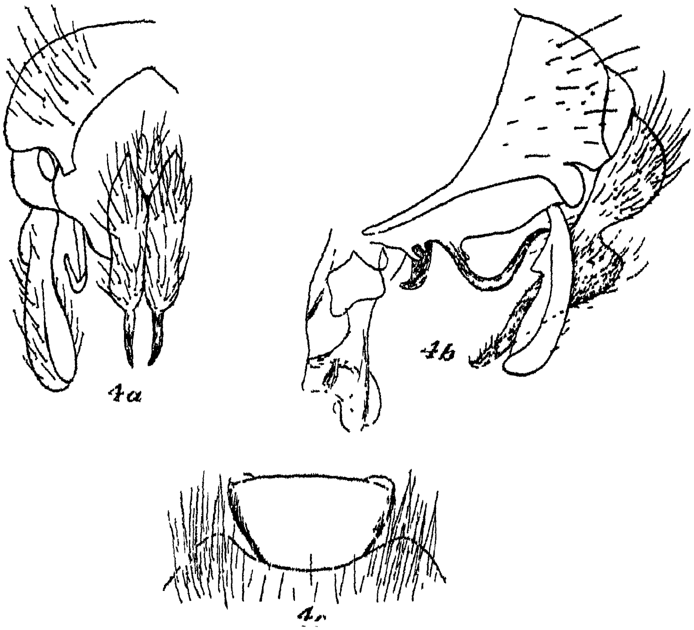


Fig. 3.—*a*, *Bengalia lateralis*, outline of eye. *b*, *Bengalia jejuna*, same.
Fig. 4.—*Bengalia lateralis*, male. *a*, hypopygium from behind, one side; *b*, same from side; *c*, fifth sternite.

Bengalia (*Ochromyia*) *jejuna* (Fabricius).

In discarding the most recent acceptance of the identification of this species in favour of the last one, I leave the matter of the specific identity of the species described by Fabricius for settlement. Personally I am inclined to accept as such the one called *lateralis* by Senior-White, and herein place this identification upon record. It is unfortunate that some of the details used by me in distinguishing the present species were not included in Surcouf's redescription of the type-specimen. The shape of the eye is quite distinct from that of *lateralis* (figs. 3 *a* & 3 *b*), as is also the form of the cheek, and the height of the latter is distinctly less than that of that species, but in these respects this species closely resembles the others, which have no strong discal bristles on the fourth tergite. I have figured the fifth abdominal sternite and the hypopygium of *jejuna* (figs. 8 *c* & 8 *a*, 8 *b*), and hope that by means of these it may be possible to definitely identify the species which is intended.

Length 11–13 mm.

I have before me two specimens from Peradeniya, Ceylon, 19. v. 13 and 29. v. 14 (*A. Rutherford*), and two from Coimbatore, S. India, one, 15. vi. 21, resting on cholam, and the other 22. ix. 13.

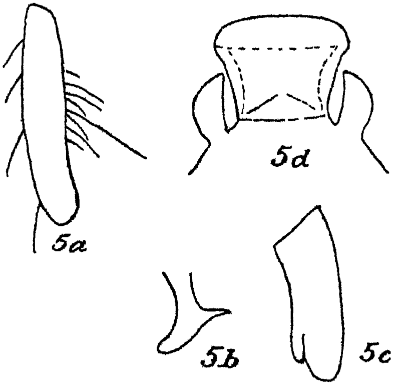


Fig. 5.—*Bengalia siamensis*, male. *a*, fore tibia from side; *b*, posterior hypopygial hook; *c*, outer hypopygial forceps; *d*, fifth sternite (after Senior-White).

Bengalia (*Ochromyia*) *siamensis*, Senior-White.

I have not seen this species. Judging from the figures which accompany the description it is quite different from the other species of the genus in the armature of the fore tibia of the male (fig. 5 *a*), and the fifth sternite, outer pair of claspers, and the small posterior inner pair of hypopygial hooks are entirely different from those of the next species (figs. 5 *b*, 5 *c*, 5 *d*).

Originally described from North Siam. Type in the British Museum.

Bengalia (*Ochromyia*) *recurva*, sp. n.

Male and *female*.—Similar to *jejuna* in colour, the abdominal fasciæ rather faint in some specimens of the type-series owing to the insects being rather teneral. Most of the hairs on mesopleura are dark, but all of those on the pteropleura and surrounding the stigmatal bristle are yellow.

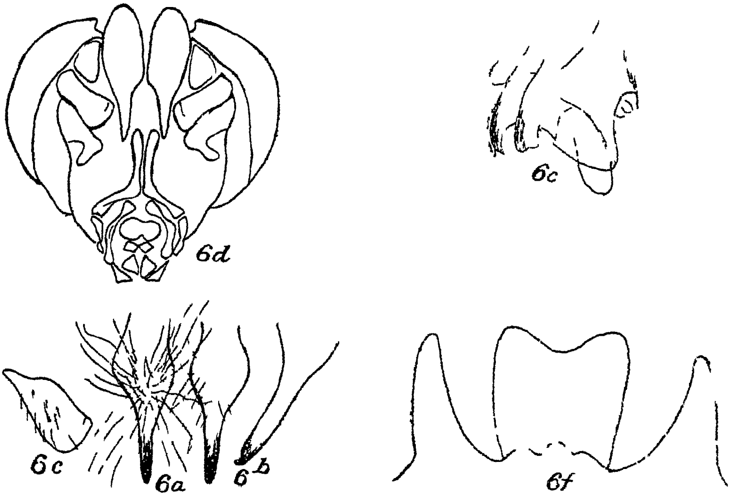
The fore femur of male has the usual engrossment of some of the bristles near middle of the postero-ventral series, and the basal half or more of the antero-ventral surface with quite long erect black bristly hairs; the fore tibia in same sex has usually three stout spines slightly basad of middle on ventral surface, beyond which the tibia is slightly hollowed out, and there are a few much shorter black bristles; the mid-tibia has one antero-dorsal and two postero-dorsal bristles, and the hind tibia has two antero-dorsal and antero-ventral bristles, and no long hairs; the mid-femur of male has about four short stout apical postero-ventral spines, and the hind femur has about six long bristles on basal two-thirds of postero-ventral surface and some shorter bristles apically on antero-ventral surface; the female has the usual ventral bristle on mid-tibia, and the femoral bristles are weaker. Male hypopygium as in figs. 7 *a*, 7 *b*, 7 *c*.

Length 13–14.

Type, Mt. Maquiling, Luzon, Philippine Islands (*C. F. Baker*); allotype and two male paratypes, Camp Keithley, Mindanao, Philippine Islands, "in houses and privies at night" (*E. L. Munson*); one female paratype, Pahang, Federated Malay States, Wray's Hill, 600 feet, December 8, 1921 (*H. M. Pendlebury*).

Type in author's collection, other Philippine specimens in United States National Museum, last-mentioned paratype in British Museum.

It is not improbable that this species is already described, but it has been impossible for me to place it definitely amongst any of those of the older authors, and it is certainly not amongst those listed by Senior-White from the Orient unless it may be his *siamensis*, which is impossible if his drawings are correct.



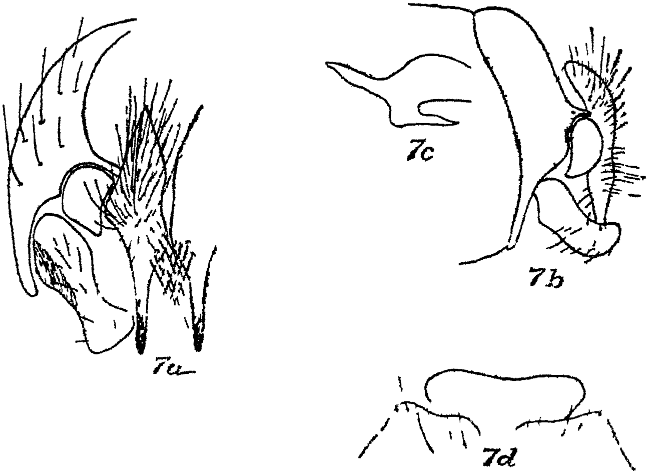
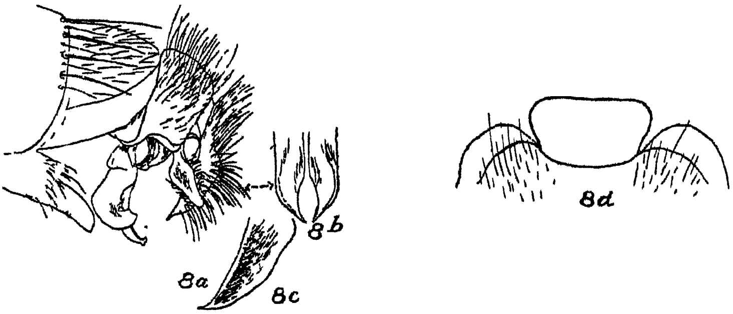
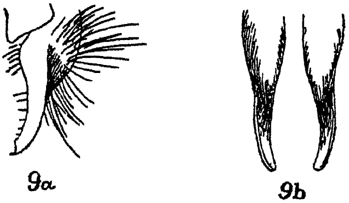


Fig. 6.—*Bengalia concava*, male. *a*, posterior hypopygial forceps from behind; *b*, same from side; *c*, outer forceps from behind; *d*, hypopygium from below; *e*, apex of penis from side; *f*, fifth sternite.

Fig. 7.—*Bengalia recurva*, male. *a*, hypopygium from behind; *b*, same from side; *c*, posterior hypopygial hook; *d*, fifth sternite.





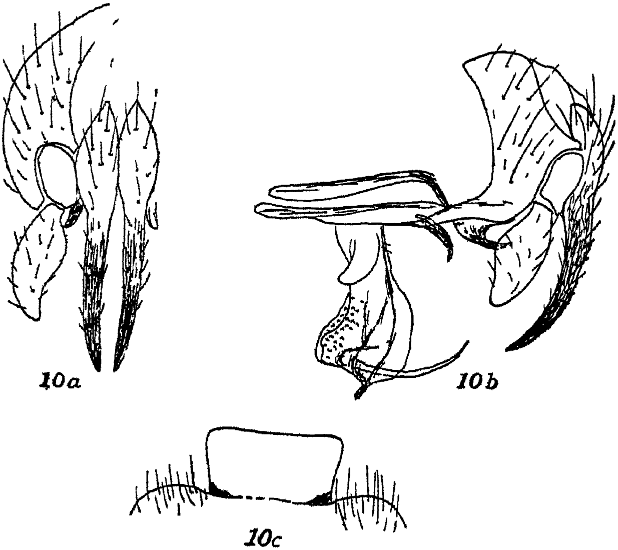


Fig. 8.—*Bengalia jejuna*, male. *a*, hypopygium from the side; *b*, posterior forceps, apices from behind; *c*, same from side; *d*, fifth sternite.

Fig. 9.—*Bengalia xanthopyga*, male. *a*, posterior hypopygial forceps from side; *b*, same from behind.

Fig. 10.—*Bengalia minor*, male. *a*, hypopygium from behind, one side; *b*, same, side view; *c*, fifth sternite.

Bengalia (*Ochromyia*) *concava*, sp. n.

This species, which is known to me from a single male, is very similar to the one next preceding, but it has a slender process on each side of the central plate of the fifth abdominal sternite, which is not present on the other, and the hypopygium is as in fig. 6. The other characters are almost exactly alike, so that it is unnecessary to describe it in detail.

Length 13 mm.

Type, Perak, Federated Malay States, Taiping Hill, 500–1500 feet, December 11, 1923 (*M. R. M.*).

Type in British Museum.

Bengalia (*Ochromyia*) *aliena*, sp. n.

Female.—This species is very similar to the female of *jejuna*, but it is distinguished from it and all other species of the same group by the strongly-developed bristles on the upper margin of the pteropleura. This character and the other listed features in the key ought to separate the species from all other African forms, and as none are listed from that continent without strong bristles on the disc of the fourth abdominal tergite, so far as I am at present aware, it ought to be readily identified even in the male sex when it occurs.

Length 13 mm.

The only data upon the specimen is a written label, "Gabon, N'Djoli," which I am unable to interpret.

Type in Paris Museum.

Bengalia (*Ochromyia*) *africana*, sp. n.

Female.—A smaller and darker species than the above, with the pteropleural armature consisting of black hairs which are rather stiff above, but not in the form of stout bristles as in *aliena*. As in the latter the labrum is not distinctly protruded, and is in the form of a narrow rounded band of chitin, but the palpi are broader at apices than in that species, and practically all of the hairs on the pleura are black. The apex of third visible tergite has the two central bristles much shorter than usual, but the specimen is not exactly normal, so that this character may not be invariable; and the fourth tergite is slightly notched at apex in centre, which is not the case in *aliena*.

Length 11 mm.

Type, S. Masai Reserve, Kenya Colony, 11. v. 1913 (*T. J. Anderson*).

No African species but *aliena* is known to me in which the discal bristles on the fourth tergite are lacking.

In all of the species in the next group there are at least two strong discal bristles on the middle of the fourth tergite, and in the males there are quite long ventral hairs on at least the hind pair of tibiæ, neither character being found in the species already dealt with in this paper. Another, but less obvious, character distinguishing the groups is the presence of a pair of subapical discal bristles on the scutellum in the following species and its absence in the preceding group.

Bengalia (Ochromyia) peuhi, Brauer & Bergenstamm.

This and the next described species are distinguished from their allies by the presence of one or two distinct bristles on the postero-dorsal surface of the hind tibia. I have before me both sexes of *peuhi* and find the bristles in both, but I have only the male of *minor*, so cannot say if the bristles are present in the female of that species also.

A very distinctive character of the present species lies in the glossy black hypopygium of the male, which contrasts sharply with the reddish-testaceous colour of the remainder of the abdomen. The latter is checkered somewhat after the style of a species of *Scarophaga*, and usually has no trace of a blackish apical fascia on the tergites. The male has the fifth sternite as in fig. 11 *c* and the hypopygium as in figs. 11 *a* & 11 *b*. The fourth tergite in the female has usually a series of median bristles, the fourth nearest middle being the strongest.

Length 12–14 mm.

Localities.—Monkey Bay, Lake Nyasa, Nyasaland, 21–24. iv. 1915 (*Dr. W. A. Lamborn*); Maktau, and Kabete, B.E.A., 25. ii. 1916 (*T. J. Anderson*); N. Territories, Gold Coast, February 1916 (*Dr. J. J. Simpson*); Abyssinia, 1919 (*A. Marchand*); Obok (*Jousseaume*); and a large series labelled, Haute Volta, Gaoua (*H. Labourel*, 1921).

The first three in the British Museum, the last three in Paris Museum.

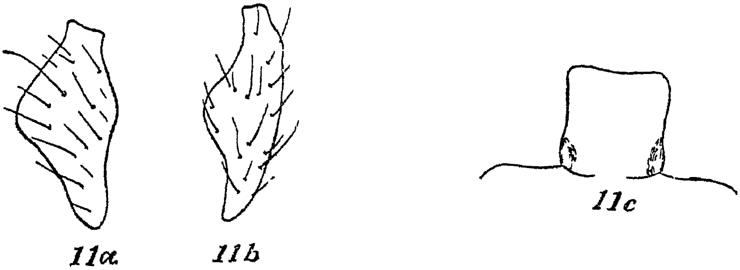
Bengalia (Ochromyia) minor, sp. n.

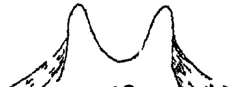
This species resembles the preceding one very closely in colour, but though the metanotum is black as in that species the basal globose portion of the hypopygium is of the same colour as the remainder of the abdomen and not glossy black. The fifth sternite is shorter, broader, and transverse at apex (fig. 10 *c*), and the hypopygium is as in figs. 10 *a*, 10 *b*. The fore tibia has no distinct short spine on the ventral surface in one of the specimens, but in the other there are a few quite inconspicuous black spines present basad of the middle, and in neither specimen is there a distinct hollowing out of the tibia. The fore femur in neither species has long antero-dorsal hairs basally, which feature is so characteristic of the males of the preceding group. The ventral hairs on hind tibia are rather short.

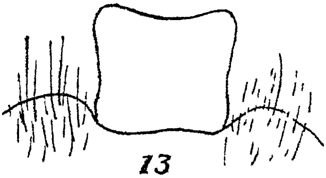
Length 8–9 mm.

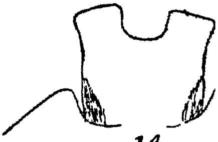
Type and one paratype, labelled in writing, "Yélimené, de Zeltner."

Type in Paris Museum.




12


13


14

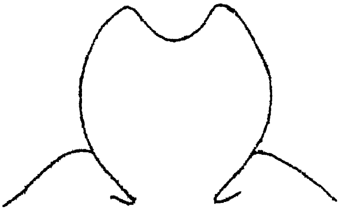

15

Fig. 11.—*Bengalia peuhi*, male. *a*, outer hypopygial forceps from behind; *b*, same from side; *c*, fifth sternite.
Fig. 12.—*Bengalia spinifemorata*, male: fifth sternite.
Fig. 13.—*Bengalia inermis*, male: fifth sternite.
Fig. 14.—*Bengalia spurca*, male: fifth sternite.
Fig. 15.—*Bengalia emarginata*, male: fifth sternite.

Bengalia (*Ochromyia*) *spinifemorata*, Villeneuve.

This species, as I have identified it, is readily distinguished from its allies in the male sex by the peculiar fifth abdominal sternite (fig. 12), and in the female sex by the characters cited in the key. The male is rather slender, as, in fact, are the two preceding species in that sex, and there are no distinct apical dark fasciæ on the abdominal tergites.

Length 10–11 mm.

Localities.—Willow Grange, Natal, March and April, 1914 (*R. C. Wroughton*); Salisbury, S. Rhodesia; and Entebbe, Uganda, 3. v. 1909 (*C. C. Gowdey*).

Bengalia (*Ochromyia*) *spurca*, Brauer & Bergenstamm.

A more robust and darker species than any of the three preceding, and with more obvious dark apices to the abdominal tergites. The structure of the fifth abdominal sternite of the male (fig. 14) and the armature of the third to fifth sternites in the female readily distinguish the species from any of its allies.

Length 11–12 mm.

Localities.—Ibadan, S. Nigeria, 24. ix. 1920; Ivory Coast (*Dr. Bouet*); and a specimen with label Reg. O. de Zinder, Maradi, Mission Tilno (*Dr. R. Gaillard*); and one, Haut-Togo (*de Gironcourt*); the whole except the first in the Paris Museum, the first in British Museum.

Bengalia (*Ochromyia*) *depressa*, Walker.

I sent my key to the species of this genus to Mr. F. W. Edwards of the British Museum, and asked him to place the species in that institution in it if possible. He is of the opinion that *unicalcarata*, Villeneuve, is identical with *depressa*, Walker, and I am accepting this synonymy herein.

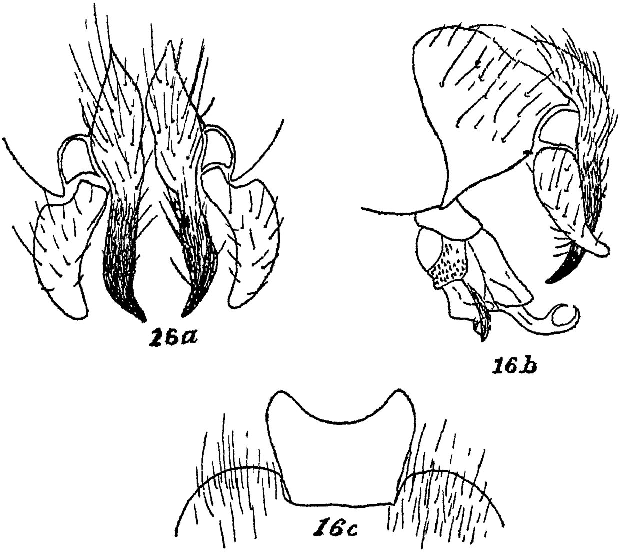
The species is represented in the material before me by one male and one female. The male has the fifth abdominal sternite as in fig. 16 *c*, and the insect is very similar in most respects to *latro*, de Meijere. Possibly the specimen from Abyssinia that Bezzi mentions as being similar to *latro* was *depressa*, though from the context of his paper one would suppose that he knew the latter species.

Length 11–12 mm.

Localities.—Embu, B.E.A., 10. iii. 1914; and Winklespruit, 28. xii, 1918 (*C. N. Barker*).

Bengalia (*Ochromyia*) *latro*, de Meijere.

I have before me a male and female of this species, the



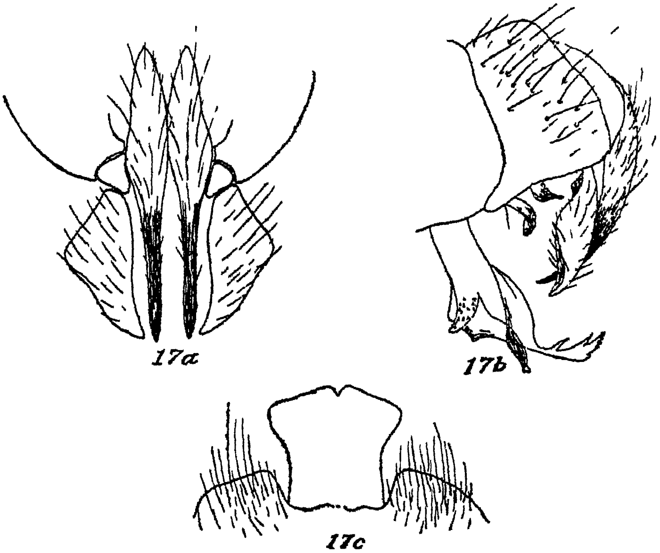


Fig. 16.—*Bengalia depressa*, male. *a*, hypopygium from behind; *b*, same from the side; *c*, fifth sternite.

Fig. 17.—*Bengalia latro*, male. *a*, hypopygium from behind; *b*, same from the side; *c*, fifth sternite.

former sent to me by the late Dr. M. Bezzi and the female by Mr. E. Jacobson. There can be no doubt as to the correctness of the identifications of these specimens, I think. The male was collected by Mr. Jacobson in Java in 1909 and the female in Sumatra in 1925 by the same collector.

It is evident that unless Senior-White got his drawings mislabelled he has misidentified *latro* and redescribed it as *bezzii*, though I cannot understand how the hind tibiæ could be described as not fringed, there being quite long fine hairs on the apical halves of the antero-ventral surface, and much shorter and sparser hairs on the apical third of the postero-ventral surface. The fifth abdominal sternite of the male of the true *latro* has the central plate long, and its apex truncate or slightly rounded and with usually a very small or no evident central emargination (fig. 17 *c*).

Mr. Senior-White has synonymized *latro* with *varicolor*, Fabricius, and, as he says the hypopygia agree, it appears that, unless as above stated there has been a confusion of the drawings, *varicolor* is distinct from *latro*, and *bezzii* is a synonym of the latter. The species listed as *latro* by Senior-White is evidently the one included next in this paper.

Length 8–11 mm.

I have before me a large series of specimens from Coimbatore sent to me by Mr. Y. Ramachandra Rao, several specimens from Mt. Maquiling, Los Banos, Baguio, and Cuernos Mts., Philippine Islands (*C. F. Baker*), in addition to the two already mentioned.

The colour of this species is very variable in the series before me, the darkest examples being from the Dutch East Indies and Philippines.

It is probable that this is *varicolor*, Fabricius, but it will be extremely difficult, if not impossible, to decide this question, and Senior-White's decision as to the synonymy is rather confusing.

Bengalia (*Ochromyia*) *emarginata*, sp. n.

This species is evidently the one accepted as *latro* by Senior-White. It is a very dark-coloured one, quite similar to *xanthopyga* in colour, but belongs to the group with strong discal bristles on the fourth visible abdominal tergite. Both the male and female before me have the abdomen fuscous, yellowish only on centre of venter, the apices of the tergites black, and their bases broadly grey-dusted. The femora in the male are almost entirely fuscous, those of the female are paler, only the mid and hind pairs being infuscated. The pteropleural and mesopleural hairs are almost all black, and there are some black hairs above the stigmatal bristle.

The mid-femur in male has about eight short stout spines near apex of postero-ventral surface, the mid-tibia in same sex has some rather long postero-ventral hairs apically, and both the hind femur and hind tibiæ have many long antero-ventral and postero-ventral hairs. The fifth abdominal sternite of male is as in fig. 15. Fore tibia of male with a double series of rather stout bristles before middle of ventral surface, none of which are either as long or as stout as are some of those in this series in most of the other species of the genus.

Length 13–14 mm.

Type, male, Singapore, May 1924; allotype, Kuala Lumpur, Federated Malay States, July 27, 1921 (*H. M. Pendlebury*).

Type in British Museum.

Assuming that this is *latro*, Senior-White, the species occurs also in Ceylon and India.

Bengalia (*Ochromyia*) *inermis*, sp. n.

Male.—This species is ochreous in colour, the thoracic dorsum is greyish-dusted and has five vittæ when seen from behind, the central and sublaterals broadest, the former brown, the others darker; abdomen with very narrow dark apices to the tergites and with changeable whitish dusting on most of their surfaces anteriorly; basal segment of hypopygium fuscous, yellowish centrally. The hairs on pteropleura and those above the stigmatal bristle are all yellow, those on the abdominal sternites except at apices and on lateral margins apically also yellow. The hairs on fifth sternite of *latro* are fuscous.

A larger species than *latro*, without any distinct short strong bristles on the ventral surface of fore tibia, and with much longer hairs on postero-ventral surface of the hind tibiæ apically; mid-femur with about six short stout spines on postero-ventral apically. The lateral bristle on first and second abdominal tergites is much stronger than in *latro*, and the central plate of fifth sternite is shorter and more nearly parallel-sided, with a more nearly transverse apex (fig. 13).

Length 13 mm.

Type, Mt. Maquiling, Luzon, Philippine Islands (*C. F. Baker*).

Type in author's collection.

This may be the species "incerta No. 2" of Bezzi's paper on the genus, but it is just as probable that the latter was the pale form of *latro*. There is no possibility of deciding the question without access to the specimens. I have, as already stated, a male of *latro* sent to me by Bezzi, and cannot understand how he could describe the "untere Lamelle schwarz, am ende zweilappig," it being as shown in fig. 17 *c*. I am, of course, assuming that his "untere Lamelle" is the central process of the fifth sternite. His description of the same organ in his *varicolor* as "breit und stumpf" fits *latro* fairly well, and that of "incerta No. 2" ("klein und kurz zweilappig") might be accepted as applicable to *inermis* mihi. Bezzi makes no mention of having a specimen of *latro* from Java, and I assume that the species he had from Formosa was the one described as *emarginata* in this paper, the specimen sent to me by him being received subsequent to the publication of his paper. What species he had from Africa that agreed with his Formosan species can only be determined by an examination of the insect itself. If my surmise is correct, Formosa would have to be added to the localities for *emarginata*.

I have been unable to find any specimen which might be accepted as *surcoufi*, Senior-White.

Genus CALLIPHORA, Robineau-Desvoidy.

I have before me two very closely allied Oriental species of this genus which require elucidation. One of these is evidently *fulviceps*, van der Wulp, and the other appears to be undescribed. Both species are somewhat similar to *erythrocephala*, Meigen, in habitus and colour, but the abdomen is metallic blue-green or violet-blue, and lacks the dusting except on fourth tergite, where there is slight even whitish dust; the anterior margin of frons, all of face and cheeks, are fulvous-yellow, the hairs on the latter being largely fulvous, black only on the upper anterior portion of the raised part; and the prothoracic spiracular covering is fulvous. The calyptræ are entirely fuscous.

The posterior sublateral bristle is lacking in both species.

These are the only two typical species of the genus known to me from the Malayan region, and below I present a diagnosis of their specific distinctions.

A. Thorax with only one pair of presutural acrostichal bristles; third antennal segment entirely black, constrasting sharply with the fulvous second segment . . . . *fulviceps*, van der Wulp.

AA. Thorax with two pairs of presutural acrostichal bristles; third antennal segment brown, becoming reddish at base and below, and not darker here than second segment	*malayana*, sp. n.

Calliphora fulviceps, van der Wulp.

I have before me a series of seven specimens including both sexes, from Tjibodas, Java, 1400 m., August 1921 (*Karny*).

Calliphora malayana, sp. n.

Female.—In addition to the characters mentioned in key this species has the abdomen metallic blue-green, almost without any of the violet suffusion so evident in the female of *fulviceps*.

Length 10–11 mm.

Type and four paratypes, Gunong Benom, Pahang, Federated Malay States, July 29 (type), and 31, and August 1, 1925 (*I. H. N. Evans*).

Type in British Museum, paratypes in author's collection, and returned to Mr. H. M. Pendlebury, of the Federated Malay States Museums.

Family Tachinidæ.

Within the past five years there have appeared several comprehensive papers dealing with the genera and species of this family, two of these upon the Palæarctic species, one by Stein and the other by Lundbeck, and a third upon the South American genera by Townsend. It is unfortunate that not one of these has in it any of the most recent characters for the division of the larger groups and very few of the recently discovered characters for the separation of the genera have been used. There is no doubt whatever that a very drastic revolution of the classification of the family and its allies will be the outcome of the work of the next decade, and the present writer is attempting to devise means for the more reliable differentiation of such genera and species as are sent to him from all over the world, without however having in mind a complete revision of the family now under discussion. Only the more outstanding forms will be dealt with from time to time and only such as possess striking and novel characters. To attempt to identify already described species without seeing the types thereof is folly, and to go on describing as new species that may have been the recipients of numerous prior names is even worse. Unfortunately, both of these courses have been taken by several workers, and the literature of exotic Tachinidæ is a sorry mess, without possibility of elucidation that does not entail a vast amount of work, and that only reliable which is based upon type-examination.

In this present paper I present a few species as new which I am confident have not been heretofore described, and all of them possess characters that will readily serve to identify them from any others known to me.

I have in the press now a revision of the Calliphoridæ of Australia and also a paper dealing with some of the genera related to *Rutilia*, both of which may prove of interest to other students of the Calyptrate flies.

Genus MALAYIA, Malloch.

I erected this genus in 1926 for the reception of a species, *fuscinervis*, Malloch, from the Federated Malay States. Before me now is a second species, very closely allied, which is described below. This second species agrees in the cited generic characters, and general coloration, with the genotype, and consequently does not require to be so completely described as that species. I present below a short diagnosis of the two species:—

A. Wings hyaline, with a fuscous border to all the veins from middle of wings to apices, including both cross-veins and costa; frontal orbits wide, either as wide as interfrontalia on entire length; postsutural dorso-centrals in type consisting of three distinct pairs .... *fuscinervis*, Malloch.

AA. Wings fuscous, paler posteriorly, and with a pale line in centre of discal cell, a pale mark beyond apex of first vein, another near apex of submarginal cell, a short pale line in first posterior cell, and a larger hyaline area in second posterior cell; frontal orbits narrower, neither over half as wide as interfrontalia at any part; postsutural dorso-centrals in type four pairs, the anterior two pairs short .... *nigripennis*, sp. n.

Malayia nigripennis, sp. n.

Female.—A shining black species, with entirely black antennæ, the lateral margins and presutural area of mesonotum grey-dusted, the latter with two submedian black vittæ as in the genotype. Abdomen slightly greyish-dusted on anterior lateral angles of tergites. Calyptræ white. Halteres black.

Third antennal segment haired on upper margin as in genotype, its length about five times that of second; palpi short and stout. Thoracic bristles and the apical central pair on each tergite not so strong as those of genotype. Legs stout, tarsi slightly thickened, fore tibia with one posterior and one or two antero-dorsal bristles, mid-tibia with one antero-dorsal and one or two postero-dorsal bristles; hind tibia with two antero-dorsal, two postero-dorsal, and two or three antero-ventral bristles. Both species have a few infrasquamal setulæ. Inner cross-vein about two-fifths from apex of discal cell. Otherwise as genotype.

Length 6 mm.

Type, Bukit Kutu, Selangor, Federated Malay States, 500–1000 feet, April 12, 1926 (*H. M. Pendlebury*).

Type in British Museum.

Genus SEMISUTURIA, Malloch.

Generic Characters.—If one considers the very short-haired arista as indicating group-affinities, this genus runs to *Morphomyia*, Rondani, in Williston's key to the genera of Dexiinæ of North America. A comparison of specimens with the genotype, *tachinoides*, Fallen, shows many points of resemblance, but the tergites of the abdomen in *Semisuturia* are not distinctly separated by transverse sutures except laterally, while in *Morphomyia* and other genera known to me the sutures dividing the tergites are complete. If, on the other hand, one disregards the short aristal hairs as of value in indicating group-relationships and assigns the genus to Tachininæ, it will run to *Œstrophasia* in the same manual, but here the same character as above stated will suffice for its recognition.

A summary of the characters is as follows:—Arista very short-haired; eyes with sparse microscopic hairs; face without a vertical carina; antennæ in profile inserted close to middle of eyes; cheek not one-third of the eye-height, usually with one or two moderately strong bristles about middle on the raised part; vibrissæ situated a little above the mouth-margin, some shorter bristles above them; parafacials bare; proboscis short; palpi well developed. Thorax with 2 or 3 + 3 dorso-centrals and 1 or 2 + 2 acrostichals; only two bristles on presutural area, the posterior sublateral lacking; intra-alars two pairs; prosternum, propleura in middle, post-alar declivity, and metanotum bare; sternopleurals 1 + 1; posterior spiracle with pronounced posterior flap. Abdomen ovate or elongate-ovate, the tergites apparently fused centrally, each with a pair of strong bristles on middle, except in some cases on first. Costal thorn present; inner cross-vein well proximad of apex of first vein; bend of fourth vein subangular; first posterior cell open, its apex quite close to wing-tip; third vein setulose at base, other veins without setulæ. Lower calypter lobulate basally on inner margin, and lying close to scutellum.

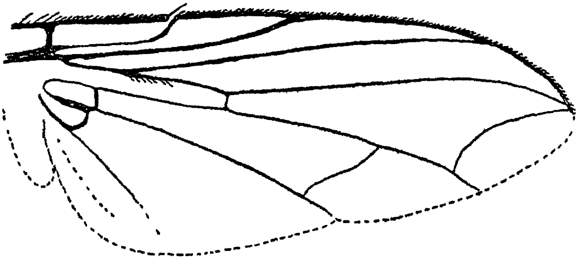
Genotype, *Semisuturia australis*, Malloch.

This genus was described by me in a recent paper dealing with Australian forms and the genotype belongs to Australia. I published the following key, except one caption, in the paper in which the genus was originally described, and thus established the specific name, but the descriptions are given now for the first time.

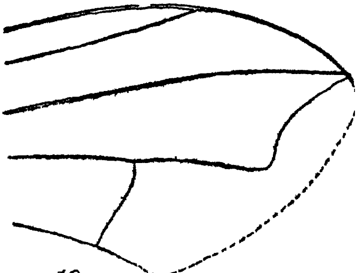
Key to the Species.

1.	Bend of fourth vein with a quite conspicuous vein emanating from it at angle (fig. 18)	2.
	Bend of fourth vein without any evidence of a vein emanating from it at angle (fig. 19)	4.
2.	Abdominal tergites, except first, each with a pair of discal macrochætæ in same line as apical central pair; metanotum and abdomen glossy black, basal tergite and sides of second yellow	*nitidiventris*, Malloch.
	Abdominal tergites, except fourth, without discal macrochætæ; abdomen not coloured as above	3.
3.	Third antennal segment entirely black; abdomen glossy brownish black, apex of fourth tergite yellow	*nigricornis*, Malloch.
	Antennæ entirely yellow; abdomen yellow, brownish apically	*flavicornis*, Malloch.
4.	Third antennal segment entirely black	5.
	Third antennal segment largely or entirely yellow	6.
5.	Entire insect, except third antennal segment, fulvous testaceous	*australis*, Malloch.
	Thorax with black dorsal vittæ, abdomen glossy black on dorsum, apex of fourth tergite fulvous	*pahangensis*, Malloch.
6.	First visible abdominal tergite with a pair of macrochætæ on middle of hind margin; outer cross-vein and costa apically without clouding	*hyalipennis*, Malloch.
	First visible abdominal tergite without developed macrochætæ on middle of hind margin	7.

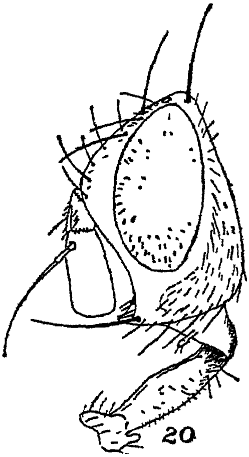
7. Outer cross-vein and costa beyond apex of second vein clouded with brown; abdomen testaceous-yellow, with one or more of the tergites with a black triangular mark in middle of hind margin .... *triangulifera*, Malloch.
   Outer cross-vein and costa not clouded; abdomen glossy black, except at base .... *sumatrana*, sp. n.



18



19



20

Fig. 18.—*Semisuturia nitidiventris*, wing.
Fig. 19.—*Semisuturia triangulifera*, wing.
Fig. 20.—*Palpina scutellaris*, head from the side.

Semisuturia nitidiventris, Malloch.

Male.—Glossy fulvous-yellow. Third antennal segment pale brown; arista fuscous, basal fourth yellow; orbits white-dusted. Thorax rather broadly fuscous on dorsum, slightly trivittate; metanotum black. Abdomen glossy black, basal tergite and sides of second fulvous-yellow.

Legs fulvous-yellow. Wings yellowish hyaline. Calyptræ and halteres yellow.

Frons in front of ocelli about as wide as third antennal segment, above antennæ about three times that width, orbits bristled to near anterior ocellus, the bristles becoming weaker as they ascend, one outer fine hair between each pair of bristles, ocellar bristles fine and rather short, inner vertical pair long, outer pair lacking; parafacials linear; antennæ extending over two-thirds of the face-length, third segment about 1·5 as long as second; arista with its longest hairs about as long as its basal diameter; vibrissæ separated by about twice as far as either is from eye; cheek strongly setulose on the lower differentiated portion, some of the anterior setulæ quite bristle-like; palpi slender. Thorax with quite numerous black setulose dorsal hairs; a strong bristle on mesopleura near upper anterior angle; scutellum with a strong bristle near base on each side above the lateral edge, about ten or twelve marginal bristles, between the apical pair two setulæ, two preapical discal bristles, numerous black discal setulæ, and some below level of marginal bristles on each side basally; a quite prominent bristle slightly behind level of posterior dorso-central and closer to it than post-alar, the usual additional bristle close to the latter. Abdomen robust, oval, a few bristles on lateral curvature of first and second visible tergites, a pair on centre of hind margin of same tergites, another pair on middle of disc of tergites 2 and 3, and complete series on middle of fourth and hind margins of third and fourth tergites. Fifth sternite with a pair of narrowly separated knob-like apical processes which are covered with short downy hairs. Fore tibia with a series of about seven rather irregular bristles on antero-dorsal surface, another similar series on postero-dorsal surface, and two long posterior median bristles; extreme bases of segments 2 to 5 of tarsi of all legs glossy black; mid-femur with several long bristles on basal half and a series of short setulose hairs at apex of postero-ventral surface; mid-tibia with two to four antero-dorsal and two long posterior bristles, some short setulæ on postero-dorsal surface, and a short bristle close to and basad of the ventral median bristle; hind femur with long irregular bristles on antero-ventral and basal half of postero-ventral surface; hind tibia with about three postero-dorsal and two antero-dorsal bristles, some setulæ on last-named surface, and two or three antero-ventral bristles; a prominent bristle at base of hind metatarsus below; tarsal claws long; all tibiæ with two complete series of minute black hairs on dorsum. Venation of fore-wing as in fig. 18.

Length 9 mm.

Type, Lubok Tamang, Pahang, Federated Malay States, 3500 feet, June 9, 1923 (*H. M. Pendlebury*). Type in British Museum through the courtesy of collector.

Semisuturia nigricornis, Malloch.

Female.—Differs from the preceding species in having the frons gradually darkened anteriorly, becoming almost black at anterior margin, the frontal orbits darkened above, and, like the parafacials, whitish-dusted; third antennal segment and arista black. Mesonotum less conspicuously blackened, and the abdomen glossy black on dorsum, except the yellow apex of fourth tergite.

Frons at vertex a little less than one-fifth of the head-width, widened to about one-third at anterior margin; each orbit with the upper bristle curved backward, and two forwardly directed bristles on upper half, the bristles along inner margins incurved; arista short-haired. Thorax as in the preceding species, but with two pairs of presutural acrostichals and without the distinct bristle laterad of the posterior dorso-central, the one at base of posterior post-alar weak, and eight marginal bristles on scutellum. First tergite with a pair of bristles at apex in centre. Legs as in preceding species.

Length 7 mm.

Type, Gunong Tahan Padang, Pahang, Federated Malay States, 5550 feet, January 3, 1923 (*H. M. Pendlebury*). Type in British Museum through courtesy of collector.

Since sending in the original manuscript on this genus, I have had sent to me by Mr. E. Jacobson a male of *nigricornis* from Gunong Singgalang, west coast of Sumatra, July 1925, 1000 m. In this specimen the mesonotum is almost entirely black.

Semisuturia flavicornis, Malloch.

Male.—Differs from the two preceding species in being entirely shining testaceous-yellow, the apex of abdomen alone slightly browned.

Structurally similar to *nitidiventris*, the thoracic chætotaxy being the same, except that there are two pairs of presutural acrostichals present, two more evident bristles between the strong apical marginal pair of scutellum, and there are in addition but eight marginals. First tergite with a pair of median apical bristles.

Length 7 mm.

Type, Singapore, Straits Settlements (*C. F. Baker*). Type in author's collection.

Semisuturia hyalipennis, Malloch.

Male.—Similar in colour to *flavicornis*, but with a small blackish triangle on middle of apices of third and fourth tergites.

Structurally similar to that species, but the third antennal segment is longer and narrower, and the venation of apical portion of wing is as fig. 19. First tergite with a pair of apical central bristles.

Length 6·5 mm.

Type, Singapore, Straits Settlements (*C. F. Baker*). Type in author's collection.

Semisuturia triangulifera, Malloch.

Male and *female.*—Similar in colour to *hyalipennis*, the abdomen with the same markings, but the outer cross-vein on wing and apex of second vein are more or less conspicuously clouded with brown or fuscous.

Structurally similar, but not so stout, the raised part of cheek usually with two strong bristles on disc, one beneath the other, instead of only one, and no central apical bristles on first abdominal tergites. Apex of wing as fig. 19. Scutellum normally with eight marginal bristles.

Length 5–5·5 mm.

Type, male, allotype, and two female paratypes, Cuernos Mts., Negros, Philippine Islands (*C. F. Baker*). Type in author's collection.

A male specimen in rather teneral condition agrees with the above species, but there is no clouding on the wing-veins, and the abdomen has no dark dorsal marks. It is from Selangor, Federated Malay States, November 1920 (*H. C. Abraham*).

Semisuturia sumatrana, sp. n.

Female.—Similar in coloration to *nitidiventris*, but the aristæ are brown, except the basal segment, and the dorsum of thorax is not noticeably blackened.

Structurally similar to *pahangensis*, but the bristles of the discal series on fourth tergite and those of the series at its apex are stronger and more numerous.

Length 9·5 mm.

Type, Fort de Kock, Sumatra, 925 m., 1924 (*E. Jacobson*).

Type in British Museum, through the courtesy of collector.

Semisuturia pahangensis, Malloch.

Female.—General colour as in *nigricornis*, the type with four blackish thoracic vittæ, and the fourth tergite yellow at apex.

No central apical bristles on first abdominal tergite.

Length 5·5 mm.

Type, Gunong Tahan Padang, Federated Malay States, 6000–7000 feet, December 13, 1921 (*H. M. Pendlebury*). Type in British Museum.

Genus PALPINA, nov.

This genus agrees in wing-venation with the section of *Semisuturia* in which there is a pronounced appendiculate vein at angle of ultimate section of fourth vein, but the short black costal spines end almost exactly at apex of second vein instead of well beyond it, as in that genus. The divisions between the abdominal tergites are evident, except the central portion of the one between the apical two, which is obliterated, and there are no strong central apical bristles on the first two tergites. In the structure of the head there are marked differences. Though there are but two long strong bristles on vertex in both genera, the inner pair, the palpi of *Palpina* are very small (fig. 20) as compared with those of *Semisuturia*, the eyes are distinctly hairy in the former and almost bare in the latter, the arista is furnished with very short hairs in *Semisuturia*, bare in *Palpina*, and the third antennal segment is wider in the latter than in *Semisuturia*. The posterior pair of presutural acrostichals in *Palpina* is very close to the suture, while in the other genus it is far in front of it.

Genotype, the following species.

Palpina scutellaris, sp. n.

Female.—Head testaceous-yellow, upper occiput fuscous, grey-dusted, frons brown, the orbits whitish-dusted; antennæ fulvous-testaceous, third segment browned along upper and apical margins; palpi testaceous-yellow. Thorax shining black, largely yellow on propleural region and along lateral margins of mesonotum, the scutellum testaceous-yellow, mesonotum greyish-dusted, and with two or four black vittæ anterior to suture. Abdomen glossy black; sides of first tergite, anterior lateral portions of second, and apex of fourth, testaceous-yellow; the surface without dusting. Legs testaceous-yellow, tarsi slightly darker. Wings yellowish hyaline, veins brownish apically, yellow basally. Calyptræ and halteres yellow.

Frons at vertex about one-fifth, at anterior margin about one-third, of the head-width; postvertical bristles very small, ocellars longer but weak; profile as fig. 20. Thorax with 3+3 acrostichals and dorso-centrals, apparently the full complement of five bristles on the presutural area, interalars 3, scutellars 8–10, the apical pair short; prosternum bare; sterno-pleurals 3; some hairs on metanotum below lower calypter. Fore tarsus slightly widened from second to fifth segment inclusive; hind tibia with eight to ten irregular antero-dorsal bristles. Lower calypter lobulate on inner side and contiguous to scutellum at base.

Length 7·5 mm.

Type, Bukit Kutu, Selangor, Malay Peninsula, 3500 feet, April 20, 1926 (*H. M. Pendlebury*). Type in British Museum.

LVI.—*On the Classification of the Tertiary Nautili.*

By L. F. Spath, D.Sc., F.G.S.

When revising, in a recent paper *, the classification of the post-Triassic Nautili, I made no reference to Conrad's genus *Cimomia*, an omission to which Mr. J. R. le B. Tomlin kindly directed my attention. Since *Cimomia* has been used for Eocene forms, identified by certain authors with some of our common London Clay species, it may seem advisable to discuss briefly the affinities of Conrad's genus. This had been overlooked or ignored by many recent writers, and was not referred to in Foord's Catalogue †, but Whitfield ‡ and Newton § seem to have accepted it as an independent genus and not merely as a synonym of *Nautilus*, whilst Tryon* in 1879 listed it as a subgenus. It may also not be out of place to review at the same time some of the other genera into which the sixty Tertiary Nautili (not including twenty described "species" of *Aturia*) may be grouped.

---

* "Revision of the Jurassic Cephalopod Fauna of Kachh (Cutch)," Mem. Geol. Surv. India, Pal. Indica, n. s. vol. ix. no. 2 (1927).

† 'Catalogue of the Fossil Cephalopoda in the British Museum (Nat. Hist.),' pt. ii. (1891).

‡ "Gasteropoda and Cephalopoda of the Raritan Clays and Greensand Marls of New Jersey." Monogr. U.S. Geol. Surv. no. xviii. pp. 284–5 (1892).

§ "British Eocene Cephalopoda," Proc. Malacol. Soc. vol. i. pt. 3, p. 130 (1894).

Cimomia was proposed† in April 1866, with *Nautilus burtini*, Galeotti, 1837 (figured by Burtin, 'Oryctographie de Bruxelles,' 1784, p. 102, pl. xiv.), as genotype; and its diagnosis was as follows:—"Nautiloid, septa sinuous, double-waved, or sigmoidal, numerous. Siphuncle small, central." A month later, Conrad ‡, who then spelt the name "*Cymomia*," quoted *Nautilus lamarcki*, Deshayes §, in the first place, and cited *N. burtini*, the original genotype, merely as an additional species. Again, in 1868, Conrad ‖ gave a third version of the name, mis-spelling it this time "*Cimmomia*"; and he now included in *C. burtini*, although only doubtfully, his own earlier *Nautilus angustatus*, which has been cited by Whitfield in the synonymy of *Aturia vanuxemi* (Conrad) and is entirely different.

Foord (after d'Orbigny) doubtfully identified *Nautilus burtini* with Sowerby's *N. regalis*, but this has quite a different suture-line; he also quoted *N. lamarcki* with a (?) in the synonymy of *N. imperialis*. Here, again, there is not identity in suture-line, unless Deshayes's drawing is very inaccurate, but the Hercoglossid suture-line of both is of a type similar to that of *Cimomia burtini*. The holograph is reduced to one-half linear, and the peripheral view or section was not illustrated; but the course of the septa across the periphery indicates a wide ventral saddle. We may thus be justified in assuming with Foord that *Cimomia burtini* was a round-ventered shell, and, according to de Koninck ¶ and Conrad, it had a central siphuncle.

I previously included *Nautilus imperialis* in *Eutrephoceras*, Hyatt, since it was referred to that genus by the author ** himself; but it has to be separated from the typical forms, such as *Eu. dekayi* (Morton), *Eu. centralis* (J. Sowerby), *Eu. sloani*, Reeside[*], or the Zululand forms described by the writer[†]. These are characterized by their straight suture-lines, without a distinct lateral lobe, but there are various transitions (like *Eu. labechei*, d'Archiac & Haime, sp., *Eu. stephensoni*, Dickerson, sp., and *Eu. cookana*, Whitfield, sp.) to *Nautilus*, s. s., in which the lateral lobe is deep (*i. e.*, comes below the base-line) and the umbilical saddle becomes prominent, although it is less developed and much closer to the umbilicus than in *Cimomia* and especially in *Hercoglossa*.

---

* 'Manual of Conchology,' vol. i., Cephalopoda, p. 217.

† "Observations of Recent and Fossil Shells, with proposed new Genera and Species," Amer. Journ. Conchol. vol. ii. p. 102.

‡ "Check-list Invertebr. Fossils N. America," Smithson. Miscell. Coll. vol. vii. no. 200, p. 19.

§ "Description des Coquilles Fossiles des Environs de Paris," vol. ii. p. 767, pl. c. fig. 1 (1824?).

‖ In Cook: 'Geology of New Jersey,' Appendix A, p. 732 (Whitfield, *loc. cit.* 1892, pp. 284–5, attributed this 'Catalogue of Eocene Shells' to Meek, not to Conrad).

¶ "Description of some Fossils from India," Quart. Journ. Geol. Soc. vol. xix. p. 15, pl. viii. fig. 3 (1862).

** "Phylogeny of an Acquired Characteristic," Proc. Amer. Philosoph. Soc. vol. xxxii. p. 559 (1894).

The two London Clay species "*Nautilus*" *imperialis* and *Eutrephoceras centralis*, however, agree in having subdorsal siphuncles and no annular lobes, Hyatt's testimony to the contrary notwithstanding. In their contemporaries *Nautilus regalis* and *N. urbanus*, on the other hand, which I had left in the restricted genus *Nautilus*, the annular lobe is conspicuous in nearly all the medium-sized examples and often persists to the last septum. In the recent *Nautilus* the annular lobe generally disappears at smaller diameters; there is also a similar central siphuncle, but the umbilical saddle in the Eocene forms is often still less prominent than in the living shells.

It thus seems that the large size of this saddle in "*Nautilus*" *imperialis* justifies generic separation of this form from *Nautilus* as well as from *Eutrephoceras*, and since there is agreement in this respect with "*Nautilus*" *burtini*, it is necessary to use Conrad's name *Cimomia* for this group. It is to be noted that the siphuncle tends to be almost dorsal in the very young stage. In *N. lamarcki* there is less curvature of the suture-line, but the proportions of the lateral lobe and saddle also suggest reference to the present group rather than to *Eutrephoceras*, in which there is no true lateral lobe.

The three groups of Nautili just referred to suffice to accommodate the great majority of Eocene species now known from many parts of the world. As species that would come within *Cimomia* as here understood, we may further cite *Nautilus forbesi*, d'Archiac & Haime; *N.*

---

[*] "A new Nautiloid Cephalopod, *Eutrephoceras sloani*, from the Eocene of South Carolina," Proc. U.S. Nat. Mus. vol. lxv. art. 5, no. 2518 (1924).

[†] "Cretaceous Cephalopoda from Zululand," Ann. South Afr. Mus. vol. xii. pt. vii. no. 16, pp. 262-3 (1921).

mokattamensis, Foord; *N. leonicensis*, de Zigno; *N. seelandi*, Penecke; *N. landanensis*, Vincent; *N. wyllei*, Newton; "*Hercoglossa*" *crassiconcha*, Vogl; not to mention such more doubtful forms as those described by Deshayes and Schafhäutl. According to Vogl* species here referred to *Eutrephoceras* and *Cimomia* range up into the Lower Oligocene, with forms indistinguishable from the Eocene precursors. The forms now left in *Nautilus*, s. s., also include many doubtful or incompletely known types—like *N. parisiensis*, Deshayes; *N. staadti*, Cossmann; *N. tumescens*, Frauscher; *N. parallelus*, Schafhäutl; *N. hallidayi*, Waring; *N. subfleuriausianus*, d'Archiac, etc.,—and it seems probable that to this genus must similarly be referred such Oligocene and Miocene species as *N. allioni*, *N. decipiens*, Michelotti, *N. geelongensis*, Foord, *N. balcombensis*, *N. altifrons*, *N. felix*, Chapman, etc. On the other hand, it may yet be advisable to separate from this group certain specialised developments like *N. vicentinus* (de Zigno MS.), Oppenheim †, with perhaps *N. szontaghi*, Vogl ‡, as a traditional link.

A classification of all these Nautili into *compressi* and *depressi*, as suggested by Frauscher §, would be highly artificial, especially in view of the proved sexual dimorphism; and the configuration of the septal surface is a far better systematic character. After the Miocene, Nautili almost disappeared, and Aturids || became extinct, but Argonauts arose. Of these we now recognise some twenty forms divided into three genera, whilst, as is well known, only a few species of *Nautilus* still live. Such Pliocene examples as the Felixstowe *N. regalis*, of course, like the Crag belemnites recorded by Wood ¶, were derived from older rocks.

The genus *Cimomia* is not included in the family Nautilidæ, s. s., on account of its resemblance to *Hercoglossa*, on the one hand, and to the keeled *Deltoidonautilus*, with entomarginal siphuncle but without annular lobe, on the other. The

---

* "Die Fauna des sogenannten Bryozoenmergels von Piszke," Mitt. a. d. Jahrb. d. Kgl. Ungar. Geol. Reichsanst. vol. xviii. p. 221 (1911).

† "Die Priabona Schichten und ihre Fauna," Palæontogr. vol. xlvii. p. 253, pl iii. figs. 11-12 (1911).

‡ "Neuere Beitr. z. Kenntnis d. alttertiär. Nautiliden Ungarns," Centralbl. f. Min. p. 707 (1910).

§ "Nautilusse von Guttaring," Jahrb. d. Naturhist. Land. Mus. v. Karnten, pt. xxii. p. 187 (1893).

|| The Family Aturidæ, Hyatt, 1894, was erroneously marked as new in Spath, *loc. cit.*, Pal. Indica, p. 22 (1927).

¶ "Mon. Mollusca Crag," Pal. Soc. vol. i., Univalves, p. i. (1848).

former connects with the typical Cretaceous forms by species like *H. pavlowi* (Archangelski), *H. ægyptica*, Foord, *H. diderrichi*, Vincent, *H. merriami*, Dickerson; whilst the London Clay species *H. cassiniana*, Foord & Crick, is already transitional to *Deltoidonautilus*. The typical forms of the latter, like *D. sowerbyi* (Wetherell), *D. deluci* (d'Archiac), and *D. hazaraensis* (Das-Gupta) are connected with the less acute forms of the type of *N. somaliensis*, Newton[†], or the Senegalese forms described by H. Douvillé[‡], by a number of intermediate types, and these again lead to the compressed forms including the London Clay species here listed as *Deltoidonautilus*, sp. n., aff. *sowerbyi* (Wetherell), which resembles *Cimomia* in suture-line but has a subhexagonal whorl-section with flattened sides and subtruncate venter. *Cimomia* is thus also included in the polyphyletic family Hercoglossidæ.

Apart from two species of *Aturia*, the London Clay also yielded the rare *Paraturia parkinsoni*, characterised by its centro-dorsan slender siphuncle. This is probably an extreme offshoot of *Hercoglossa*, and is known already in the Cretaceous, whilst it may also include such Eocene species as "*Aturia*" *brunlechneri*, Frauscher. It is possible that Aturidæ are again derived from this branch of Hercoglossidæ.

The London Clay species may then be listed as follows:—

Nautilus regalis, J. Sowerby.
*—— *urbanus*, J. de C. Sowerby.
Eutrephoceras centralis (J. Sowerby).
Cimomia imperialis (J. Sowerby).
**Hercoglossa cassiniana* (Foord & Crick).
**Deltoidonautilus sowerbyi* (Wetherell).
*—— ——, sp. n., aff. *sowerbyi* (Wetherell).
**Paraturia parkinsoni* (Edwards).
Aturia ziczac, J. Sowerby.
*—— *charlesworthi*, Foord.

Those six species out of the ten listed that are marked by an asterisk are rare and represented in the British Museum (Nat. Hist.) only by one or at the most a few examples.

[†] "Eocene Nautili from British Somaliland," Monogr. Geol. Dept. Hunterian Mus. Glasgow, i. pt. 8, p. 167, pl. xviii. figs. 1, 2 (1925).

[‡] "Eocène au Soudan et au Sénégal," Bull. Com. Études Hist. Scient. Afrique Occid. Française, no. 2, pp. 139-141, pl. i. figs. 1-5 (1920).

LVII.—*Hymenoptera and a Caddis Larva from the Miocene of Colorado.* By T. D. A. Cockerell, University of Colorado.

The specimens now discussed were found by Mr. George Sternberg in the Miocene shales of Florissant, Colorado, and are the property of the British Museum.

HYMENOPTERA.

Tenthredinidæ.

Tæniurites fortis, Cockerell, 1917.

A very good specimen (50 B.), with reverse, is smaller than the type, but it is probably a male, and I see no grounds for regarding it as a different species.

Anterior wing 10 mm. long (11 in type); marginal cells together 4·2 mm.; width of head and thorax each 2 mm.; width of abdomen near base 1·5 mm., but toward apex 2·3 mm.

The insect has a Selandriine appearance with slender body and large wings. Hind legs clear red. Abdomen black at base, the posterior margin of the black deeply emarginate in middle (it is emarginate in the living *Bivena semilutea*, Norton); beyond this are five slender black sutural bands, the segments otherwise light red, the posterior margin whitish. Head and thorax black.

In my original account of this genus, I remarked that it seemed to combine the characters of the Selandriinæ and Tenthredininæ. In March 1917, Mr. S. A. Rohwer examined the type, and wrote that, while it undoubtedly belongs in Selandriinæ according to MacGillivray's classification, he was of the opinion that it should be placed in Tenthredininæ, probably in the vicinity of *Corymbas*, a genus based on a species from northern Korea.

Another specimen of *T. fortis* (7 B.), with reverse, is as large as the original type, and is certainly a female. The difference in size is no greater than that between the sexes of living sawflies, and, in spite of the different appearance, 7 B. and 50 B. may be confidently referred to the same species.

Eriocampa wheeleri, Cockerell, 1906.

In the type, part of the abdomen was missing. The new specimen (116 B., with reverse) shows that the insect is 8 mm. long, the very robust abdomen 3·4 mm. wide. The wings are faintly brownish. The transverse marginal vein is curved in its upper part, but thence is directed downward, forming right angles with the marginal vein. The second marginal cell is quite long and pointed. The original figure (Bull. Amer. Mus. N. Hist. xxii. p. 500) was drawn without entomological supervision, and is obviously incorrect in many details of the venation, though it gives a very good general impression of the fossil.

Tenthredella fenestralis, sp. n.

Robust, 8 mm. long, anterior wing 7 mm.

Very closely related to *T. infossa*, Brues, but considerably smaller, the abdomen with a large pale window-like area dorsally, and the transverse-marginal nervure meeting the third cubital cell hardly at all beyond the middle. Thorax black; abdomen dark brown, black apically, with a long (twice as long as broad) quadrate colourless patch covering rather more than middle third of segments 2 to 4, and having at its basal end (on first segment) a small square extension, one-third the width of the patch. A similar but narrower pale patch exists on the abdomen of the Japanese *T. fentoni* (W. F. Kirby).

Wings hyaline, with brown veins and stigma: first cubital cell quadrate, second over twice as long as first (considerably longer than in *T. infossa* as figured by Brues), receiving recurrent nervure considerably before the middle; first discoidal formed as in *T. infossa*; nervulus about middle of lower side of first discoidal; anal cell of hind wing long-petiolate at end as in *T. infossa*. This is the anellan cell of Rohwer and Gahan; its apical petiole is as long as the apical face of the submediellan. In living species the anellan cell is not petiolate apically, but I observe a very short petiole in the related *Tenthredo* (or *Allantus*) *basilaris*, Say, and it is well developed in several other genera. *T. fenestralis* has the basal expansion of the first anal (front wing) very abrupt, more so than is usual in species of this group.

No doubt, the generic position of the fossil species typified by *T. infossa* will have to be reconsidered, but it is difficult to find precise criteria on which to base a new genus, the species being variously intermediate in their characters.

Dineura microsoma, sp. n.

♀. Length about 6 mm., robust, width of abdomen 2 mm. or slightly over.

Head and thorax apparently black; abdomen brown, with light sutural bands; legs reddish; anterior wings 5 mm. long, dilute brownish; stigma very large, fuscous; nervures dark. The venation, so far as visible, agrees in most respects with that of the living *D. viridiorsata*, Retzius, differing as follows: marginal vein rather more curved apically, the transverse-marginal more curved and oblique, joining third cubital cell distinctly beyond the middle (approaching condition of *Hoplocampa*); intercostal vein more than its own length basad of basal (apicad of basal in *D. viridiorsata*); second recurrent ending distant from second intercubitus about equal to one-third of latter (one-half in *D. viridiorsata*); third cubital cell about twice as long as high (less than twice as long in *D. viridiorsata*). The third discoidal cell is strongly produced and pointed at the end; the nervulus is at about the middle of first discoidal, which is shaped as in *Hoplocampa flava* (L.). The anals cannot be seen. The specimen is Sternberg's 113 B., with reverse. The four species of *Dineura* known from the Florissant shales were tabulated by Rohwer in 1908. The present one is considerably smaller than the others, and runs nearest to *D. cockerelli*, Rohwer, except that it is much smaller, and has dusky wings. *D. cockerelli* also differs conspicuously in that the distance of first recurrent from second intercubitus is about equal to length of latter.

Rohwer has remarked on the mixed affinities of the fossil species ascribed to *Dineura*. All have the intercostal nervure basad of the upper end of basal, and for this reason should go in *Mesoneura*. *D. laminarum*, Brues, further, has the second recurrent nervure practically meeting the intercubitus, another *Mesoneura* character. The fact is that the fossils appear to belong to a period when the modern segregates of this group were still poorly defined, and, if we were to strictly apply the criteria now used, it might appear necessary to propose one or more new genera or subgenera. One living *Dineura* (*D. pallida*, Ashmead) has been described from Colorado; but Rohwer has recognised it in specimens which he collected on *Populus angustifolia* at Boulder, and finds that it must be called *Hemichroa pallida*, the anals being as in that genus. The present genus *Dineura* is Holarctic, with few species (Europe 10, Siberia 1, North America 5). It evidently represents the remnants of a once numerous tribe. *H. pallida*, though a *Hemichroa* on the anals, has the second recurrent well before the second intercubitus, as in *Dineura*. *Hemichroa dyari*, Rohwer, has the second recurrent meeting the second intercubitus, as in *Mesoneura*. Thus the

Dineurinæ of MacGillivray may have arisen from diverse members of his Hoplocampinæ.

Hoplocampa ilicis, sp. n.

Length 6·5 mm., anterior wing about 6 mm.

Head and thorax black, abdomen with brown bands, separated by wide hyaline bands; wings reddish, stigma and nervures brown. Venation similar to that of *H. flava* (L.), but differing as follows: marginal cell considerably more produced and narrower apically; second recurrent nervure ending not much before middle of third cubital cell (370 microns from base and 480 from apex of that cell); nervulus well beyond middle of first discoidal cell; basal part of lanceolate (anal) cell remote from apical portion, and very narrow, so as to be easily overlooked; third discoidal cell longer in proportion to its depth, and narrower apically; first discoidal cell presenting an angle at end of first recurrent nervure, as in *Dineura* and *Hemichroa*. The transverse marginal nervure ends 640 microns from base of third cubital cell.

In the hind wing the discoidellan cell is elongate-quadrate, truncate at each end, hardly angled at the upper apical corner of submediellan, which is 350 microns from its base, 480 from its apex. The specimen is partly overlapped by a leaf of holly (*Ilex*). On the same piece of rock are several specimens of *Phenacopsyche larvalis*.

In *Hoplocampa halcyon*, Norton, the first recurrent nervure is a considerable distance from the base of third cubital cell, a condition intermediate between that of *H. flava* and the fossil. In *H. halcyon*, also, there is a distinct angle at end of first recurrent, formed by it and the side of second cubital cell.

Cosilidæ.

Geotiphia pachysoma, sp. n.

♀. Length about 9·3 mm., stout, the abdomen appearing as if broadly sessile; wings very short (style of *Anthobosca arabica*, Turner), anterior wings about 6·4 mm. long, the stigma 3·9 mm. from base; width of abdomen fully 3 mm.

Black or dark brown, the abdomen apparently without spots; legs brown or ferruginous, hind tibiæ dark, very robust, the margin apparently not serrate; hind spur stout and simple; hind basitarsi long and slender (about 880 microns long), with lateral spines as is usual in Scoliidæ;

wings brownish hyaline, stigma dark, veins pale brown. Head and thorax not visibly hairy; mesothorax posteriorly with widely separated parallel parapsidal grooves; postscutellum very short, but scutellum large; metathorax with a fine median line; axillæ large. Sting visible, extending about 1 mm.

Marginal cell very broadly rounded and obtuse at end, the apex 160 microns below costa; outer side of third cubital cell strongly bulging outward (as in *Anthobosca arabica*); second intercubitus oblique, with its lower end apical, so that third cubital cell is shorter below than above; second recurrent nervure strongly arched, reaching third cubital cell slightly before the middle of its lower margin; first recurrent joining second cubital cell near middle, at a distance from second intercubitus about equal to length of latter; first discoidal cell very long and narrow (length about 1520 microns); second discoidal also long and narrow; the two parts of basal nervure about equal (each 320 microns); nervulus oblique, meeting basal. In the hind wing the nervellus meets the lower corner or angle of mediellan cell, as in *Anthobosca flavopicta*, Turner. The size and entirely black abdomen distinguish this from other Florissant *Geotiphia*.

In superficial appearance, this insect is exactly like a sawfly, and the same may be said of some living relatives, such as *Anthobosca gilesi*, Turner. The thorax is, of course, very unlike that of a sawfly, but there are striking resemblances in venation, especially in the region of the basal nervure and nervulus, to *Megalodontes*. I do not believe that these resemblances are wholly without meaning, and we have in these Cosilidæ an extremely ancient type of Vespoidea retaining some characters derived from sawfly-like ancestors. The remnants of this group still surviving are widely scattered over the earth, and are very diverse in structural details and general appearance. As Turner has stated, *Geotiphia* can hardly be separated from *Anthobosca* as understood in a broad sense, but it appears certain that *Anthobosca* must be divided.

In this connection it is profitable to consider Tillyard's Permian order Protohymenoptera and the conclusion he derives therefrom concerning the venation of the Hymenoptera. When we compare the venation of *Geotiphia pachysoma* with that of the sawfly *Megalodontes spissicornis*, it is impossible to avoid the impression that the basal portion of the radial or marginal nervure, that on the first cubital cell, corresponds with the radial cross-vein of the sawfly. The correspondence is, indeed, startlingly exact. The base of the radial sector, as understood by MacGillivray, has disappeared, and the first cubital cell of *Geotiphia* is first cubital and first marginal of *Megalodontes* combined. Now in the Australian Thynnid wasp, *Zaspilothynnus interruptus*, Westwood (male, the female is apterous), the base of the radius as understood in the sawflies is preserved, and the marginal nervure is strongly looped up to the stigma, so that the marginal cross-vein is excessively short. This wasp, however, surely has two marginal cells, in the same sense that the sawflies have two. This Thynnid also has the basal nervure, nervulus, and adjacent parts as in *Megalodontes* and *Geotiphia*. Even in bees, such as *Bombus*, the rudiment of the cross-vein in the first cubital cell is plainly visible, and it may be said that these also have two marginals. The bee-venation, as compared with other "higher" Hymenoptera, is very primitive. But returning now to Protohymenoptera (better Prothymenoptera, for euphony), and Tillyard's interpretation, we find a new point of view. According to Tillyard, the upper part of the basal nervure is part of the media, and this continues outward to divide at the basal corner of the second cubital cell, enclosing the second and third cubitals. According to this, not only the transverse marginal of sawflies, but also the base of the marginal vein, are radio-median cross-veins. Thus *Macroxyela*, figured by Tillyard, would in a morphological sense have four radial cells. I do not see that this really follows from a consideration of the Permian fossils, but, at all events, what with these and the *Geotiphia* problem just discussed, it must be admitted that the homologies are up for reconsideration.

TRICHOPTERA.

Phenacopsyche (?) *larvalis*, sp. n. (Odontoceridæ).

On specimen 50 B., close to a sawfly (*Tæniurites*), are many small, mostly fragmentary, Caddis larvæ, without cases. There is also what appears to be a pupa, but the details are obscure. These remains possibly came from the excrement of a fish. The caudal structures of these larvæ are so characteristic that the species may be described, especially since it appears to belong to the Odontoceridæ, and to fall close to the living *Odontocerum albicorne* (Scopoli), differing by the much stouter femora and the much longer caudal bristles.

Larva 5 or 6 mm. long; thorax and legs dark; abdomen hyaline, parallel-sided, posteriorly truncate, with six long somewhat curved bristles, the first (outer) ones spreading laterally, and much more distant from the middle ones than these from the inner pair; inner bristles crossing. This is referred with doubt to *Phenacopsyche*, Cockerell, 1909, the only Odontocerid genus found fossil at Florissant. It may, of course, belong to the species *P. vexans*, Ckll., described from the adult, but this cannot be determined.

LVIII.—*Systematic and Geographical Notes on Aquatic Heteroptera of the Ethiopian Region.* By Dr. TADEUSZ JACZEWSKI, Polish Museum of Natural History, Warsaw, Poland.

I.

In one of my previous papers [*] I ventured to draw attention to the fact that the systematics, morphology, and geographical distribution of the Heteroptera of the Ethiopian Region are but little known so far. A certain confusion was caused in this field by numerous papers of various authors, published without a definite plan, giving mostly only descriptions of little value of new species etc. In particular, this is also the case with the aquatic Heteroptera or water-bugs, which are of special interest to me. That is why I was particularly glad to accept the proposition made to me by Mr. B. P. Uvarov, on behalf of the Imperial Bureau of Entomology, to start studies on aquatic Heteroptera of the Ethiopian Region, based upon materials of the Bureau. I intend to publish the results of my studies in a series of contributions, which will appear gradually as the material becomes available. The first of these contributions is given below.

In the first place, I wish to express my sincere thanks to the Director of the Imperial Bureau of Entomology and to Mr. B. P. Uvarov for having enabled me to undertake this most interesting work.

Notonectidæ.

Enithares sobria (Stål).

Stål, Œfv. Vet.-Ak. Förh. Stockholm, xii. 1855, p. 89; Jaczewski, Ann. Zool. Mus. Pol. H. N. Warszawa, v. 1926, pp. 78–81.

Sierra Leone, Njala, x. 1926; leg. *E. Hargreaves*; one specimen. Uganda, Kampala, 19. vii. 1926; leg. *G. L. R. Hancock*; "? preys on mosquitos"; one specimen.

---

[*] Ann. Zool. Mus. Pol. N. H. Warszawa, v. 1926, pp. 62–63.

Enithares chinai, sp. n.

Somewhat more robust and slightly larger than *E. sobria* (Stål), which it resembles in general appearance and coloration. Head comparatively shorter and wider than in the preceding species. Anterior part of the vertex wide, twice as wide as the synthlipsis. Basal portion of the costal margin of the hemelytra straight to a certain extent, then forming an obtuse and rounded but still distinct angle (fig. 1, 2); in *E. sobria* (Stål) the costal margin of the hemelytra forms in its basal portion a soft curvature (fig. 1, 1). Metasternal xiphus resembling that of *E. sobria* (Stål), but somewhat shorter. The relative length of the different

Fig. 1.

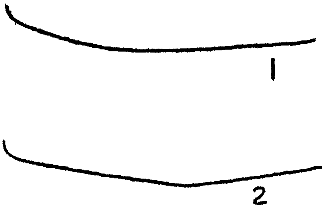


Fig. 2

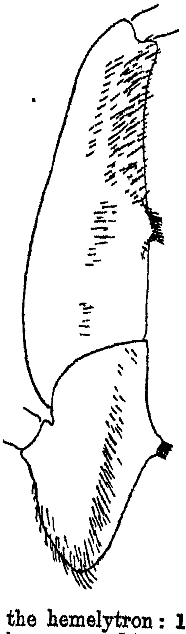


Fig. 1.—Basal portion of the costal margin of the hemelytron: 1, in *Enithares sobria* (Stål); 2, in *E. chinai*, sp. n. × 16.

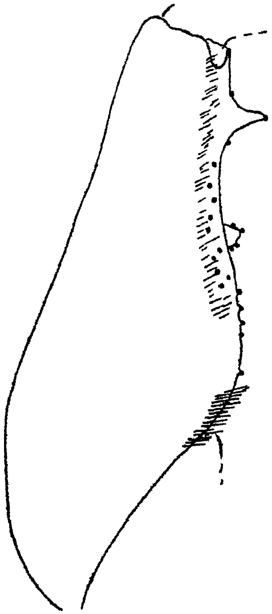
Fig. 2.—*Enithares chinai*, sp. n., ♂. Anterior trochanter and femur. × 33.

parts of the legs, expressed in percentages of the length of the corresponding femur, is as follows :—

	Femur.	Tibia.	Tarsus 1 & 2.	Tarsus 3.	Claws.
Ant. legs	100	102·6	39·7	20·5	23·1
Int. legs	100	83·3	32·5	23·7	19·3
Post. legs	100	85·3	34·9	20·6	10·3

Legs of the males: anterior trochanters armed beneath about the middle with a prominent tubercle bearing a tuft of short, black, spiniform hairs; if the insect is examined by means of a more feeble lens, this tuft gives the impression of a short black tooth (fig. 2). Anterior femora covered in their apical portion on the inner side with numerous, fairly thick, spiniform hairs; about the middle of the infero-interior side a distinct prominence is found, terminated by a tuft of short, black, spiniform hairs (fig. 2) similar to those found on the trochanteric tubercle. Anterior tibiæ and tarsi showing somewhat more densely inserted and thicker hairs than in *E. sobria*

Fig. 3.



Enithares chinai, sp. n., ♂. Intermediate femur. × 33.

(Stål). Intermediate femora beneath about the middle with a blunt outgrowth, of a somewhat irregular shape, bearing several minute black tubercles (fig. 3); similar black tubercles are scattered over different parts of the lower side of the

Fig. 4.

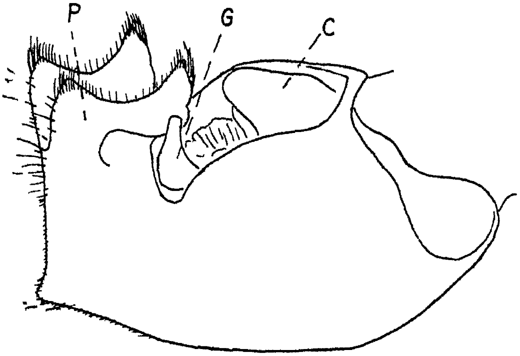


Fig. 5.

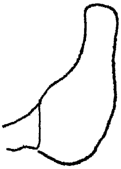


Fig. 6.

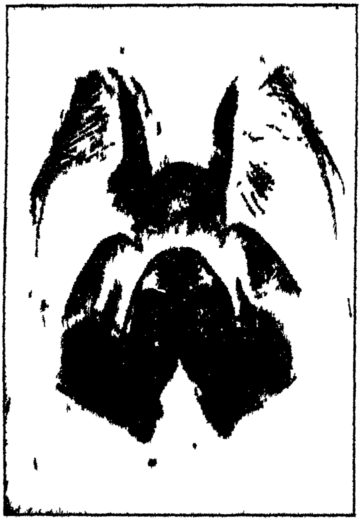


Fig. 4.—*Enithares chinai*, sp. n., ♂. "Genital capsule." *c*, anal cone; *g*, gonapophysis; *p*, posterior lobe. × 33.
Fig. 5.—Ditto. Gonapophysis. × 64.
Fig. 6.—Ditto, ♀. Ventral view of the genital and anal region. × 30.

intermediate trochanters, femora, tibiæ, and tarsi, being most numerous on the tibiæ. These tubercles are found also in *E. sobria* (Stål), but are less numerous in that species. Anterior and intermediate legs of the females almost simple, showing only very feeble angularities of the curvature at those places where in the males are found the prominences and tubercles. Anterior and intermediate claws irregularly denticulated interiorly in both sexes. The genital armature of both sexes repeats in general the characters typical for the genus, as I have described them in *E. sobria* (Stål) *, showing, however, distinct specific differences. The ninth abdominal segment or "genital capsule" of the males (fig. 4), seen from the side, is almost quadrangular in its outline; its posterior lobes—*i. e.*, the parts behind the lateral fissures—are strongly sinuated at their upper margin, forming distally and proximally prominent angularities; this upper margin of the lobes bears fairly long and dense hairs. The gonapophyses (claspers or forcipes) are slightly longer and more tapering towards the end (fig. 5) than in *E. sobria* (Stål); the penis seems to have a more strongly developed terminal tube than in that species. The genital and anal regions of the females (fig. 6) resemble very much those of *E. sobria* (Stål); the lateral lobes of the eighth segment bear interiorly a group of thickened hairs; the anal cone seems to be more feebly developed.

Length 9–9·5 mm.

I take the liberty to dedicate this species to Mr. W. E. China, of the British Museum (Nat. Hist.).

South Africa, East London, 1. v. 1925; leg. *H. T. Holden*; six specimens, one of them is chosen as the holotype. Uganda, Nawandala, 12. ix. 1926; leg. *G. L. R. Hancock*; one specimen. Sudan, Torit, 12. xi. 1917; leg. *T. R. Yardley*; one specimen.

Anisops sardea, H.-S.

Herrich-Schäffer, Fortsetzung von Hahns Abbild. Wanz. Ins. Nürnberg, 1850, p. 40; Jaczewski, *l. c.* pp. 83–86.

British Sudan, Medani, 28. i. 1923; leg. *H. W. Bedford*; "in canal"; 2 ♂♂, 8 ♀♀.

Corixidæ.

Agraptocorixa dakarica, Jacz.

Jaczewski, Ann. Zool. Mus. Pol. H. N. Warszawa, v. 1926, pp. 100–102.

Sudan, near Dilling, 8. xii. 1926; leg. *H. H. King*; "in pool"; 2 ♀♀.

---

* Jaczewski, *l. c.*

Stenocorixa protrusa, Horv.?

Horváth, Ark. f. Zool. Stockholm, xviii. A, 1926, no. 31, p. 3.

The two specimens from the material of the Imperial Bureau of Entomology, which are without any doubt females, differ in several characters from the description and from the figures given by Dr. Horváth, who had before him a specimen which he considered to be also a female. As I suspected that the specimen of Dr. Horváth was in reality a male, I asked my friend Dr. O. Lundblad (Experimentalfältet, Stockholm) to be so kind as to examine for me the type in the Stockholm Museum. Dr. Lundblad writes me as follows:—"In *Stenocorixa protrusa*, Horv., handelt es sich, wie Sie vermuten, sicher um ein Männchen. Ich habe das einzige Exemplar so sorgfältig wie möglich untersucht. Die Asymmetrie des Abdomens ist so unbedeutend, dass man sie leicht übersehen kann, was wohl Horváth getan hat." The description of Dr. Horváth concerns thus the male of *Stenocorixa protrusa*, Horv., and can be now completed with the following details:—

Face in the females convex, almost glabrous. The head, seen from the side, does not show such a prominent edge between the forehead and the vertex as in the males (fig. 7, *cf.* with fig. 1 *a* in Dr. Horváth's description). Third antennal joint almost cylindric, slightly arched (fig. 8), not club-like as in the other genera; fourth joint thinner than the third, gradually tapering towards the apex, ended by a small tuft of longer hairs; the length of the fourth joint equals about 65·4 per cent. of the length of the third. Lateral angles of the pronotal disk pointed (fig. 7). Lateral lobes of the prothorax wide, rounded (fig. 7). Parapleuræ comparatively wide, tapering posteriorly; their postero-superior margin forms an oblique straight line (fig. 7). The pleuræ show a curved suture, which begins not far from the base of the parapleura (fig. 7). Metasternal xiphus in the shape of a small rounded tubercle (fig. 9).

Fore legs of the females*: Trochanter simple. Femur slightly more slender than in the other genera of Corixidæ. Tibia almost subcylindric, simple at the apex, comparatively long. Pala (fig. 10) semicrescent-like, with about eighteen long bristles on the inner margin, and with an apical claw which is not stronger than in the representative of the genus *Sigara* (F. Schum.), Jacz. In general, the pala is rather sparsely armed with bristles. Relative length of the different parts of the intermediate and posterior legs, expressed in

---

* The leg figured by Dr. Horváth (*l. c.* p. 3, fig. 1 *c*) belongs to a male.

Fig. 7.

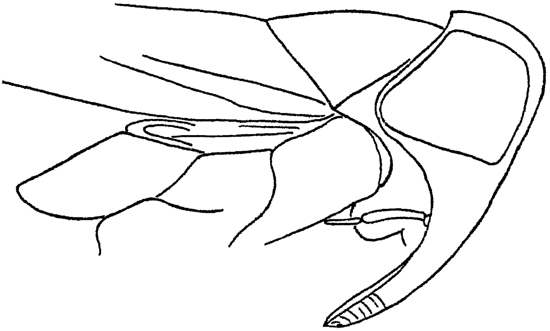


Fig. 8

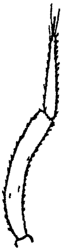


Fig. 9.

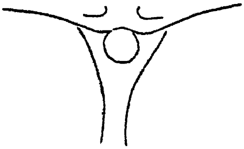
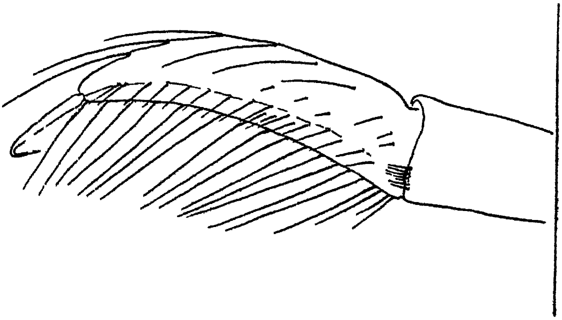


Fig. 10



Stenocorixa protrusa, Horv., ♀.

Fig. 7.—Side view of the head and thorax. × 16.
Fig. 8.—The two terminal joints of the antennæ. × 33.
Fig. 9.—Metasternal xiphus. × 33.
Fig. 10.—Pala and apex of tibia. × 52.

percentages of the length of the corresponding femur, is as follows :—

	Femur.	Tibia.	Tarsus.	Claws.
Int. legs..........	100	43·3	32·2	41·1

	Femur.	Tibia.	Tarsus 1.	Tarsus 2.
Post. legs	100	68·3	90·5	52·4

Fig. 11.

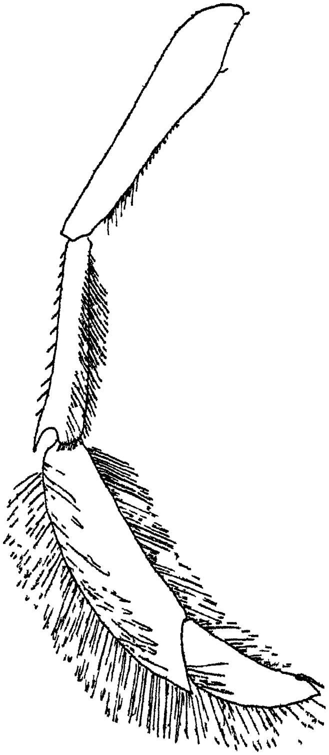
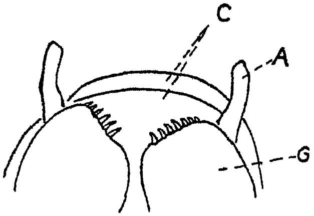


Fig. 12.



Stenocorixa protrusa, Horv., ♀.

Fig. 11.—Posterior leg. × 16.
Fig. 12.—Ventral view of the genital and anal region. *A*, acrocerci; *C*, anal cone; *G*, genital segment. × 100.

Intermediate claws distinctly longer than the tarsi, almost as long as the tibiæ. Posterior femora (fig. 11) much more slender than in the representatives of other genera of Corixidæ. Posterior tibiæ and tarsi rather short if compared with the femur; the tarsal joints very wide (fig. 11), much wider than in other Corixidæ; first tarsal joint triangularly produced externally at the apex. Posterior claws inserted laterally as in other Corixinæ; the outer margin of the tarsal joints of the posterior legs bears a certain number of flattened, lamina-like bristles, besides ordinary ones. Genital segment of the females armed with short teeth at its posterior margin; acrocerci slightly curved inwards (fig. 12).

Length 9·25 mm.

S. Sudan, ix. 1917; leg. *Capt. Yardley*; on steamer; 2 ♀♀.

Micronecta thomasseti, sp. n.

Micronecta signoreti, Jaczewski, Ann. Zool. Mus. Pol. H. N. Warszawa, v. 1926, pp. 102–103, nec Reuter!

Some time after the publication of my "Notes on some West-African Heteroptera" (*l. c.*) I received, owing to the kindness of Dr. Horváth (Budapest), a topotypical, or, perhaps, even cotypical, specimen of *M. signoreti* (Reut.) from "Addah, Guinea" (=Ada, Gold Coast Colony). Having examined in detail this specimen, I see now that the species which I had in my collection from Dakar is not *M. signoreti* (Reut.), as I determined it previously, but another species apparently new to science. As a fairly large set of specimens of the same species, collected by Mr. H. P. Thomasset at Weenen, Natal, is found in the material of the Imperial Bureau of Entomology, I am giving it the name of that collector. All that I have written in my previous paper under *M. signoreti* (Reut.) should be referred now to *M. thomasseti*.

M. thomasseti differs from *M. signoreti* (Reut.) at first sight by its larger size [length 4–4·25 mm. in *M. thomasseti*, while only 3–3·3 mm. in *M. signoreti* (Reut.)]. As to coloration, the two species are almost identical. The postocular space of the head is distinctly wider in *M. thomasseti* than in *M. signoreti* (Reut.); the frontal arch is more prominent in the former than in the latter. The vertex shows in *M. thomasseti* a more or less distinct infuscated median line. The pronotal disk is much larger in *M. thomasseti* (being in this species as long as the vertex (fig. 13)) than in *M. signoreti* (Reut.), where it is distinctly shorter than the vertex. Finally, the shape of the male gonapophyses (claspers or forcipes) is quite different in the two species in question (*cf.* fig. 14 and Jaczewski; *l. c.* fig. 72).

From *M. sulcata* (Sign.), so far as I am able to judge from the description and figure given by China*, *M. thomasseti* seems to differ by the comparatively longer head, which is as long as the pronotal disk, while in *M. sulcata* (Sign.) "the head is about four-fifths the length of the pronotum in the middle" †. *M. sulcata* (Sign.) seems to be also a somewhat smaller species, measuring in length 3·3 mm. as given by China †.

The following data concerning the geographical distribution of *M. thomasseti* are known up to the present:—

French Senegal, Dakar (Jaczewski, *l. c.*).
Natal, Weenen, 2840 ft.; leg. *H. P. Thomasset*:
  xi. 1923; four specimens.
  xi. 1923; "in thorn country"; three specimens.
  xi.–xii. 1923; one specimen.
  xii. 1923; five specimens.
  i. 1924; one specimen.

I choose as the type the specimen from Dakar.

Fig. 13.

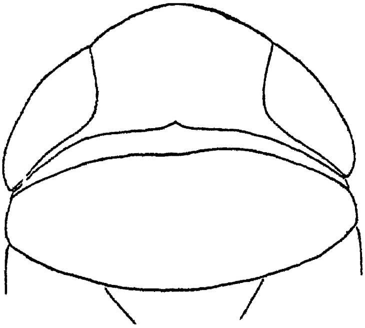


Fig. 14.

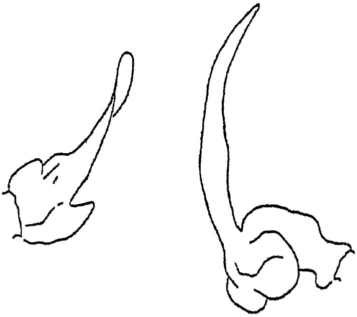


Fig. 13.—*Micronecta thomasseti*, sp. n. Head and pronotum seen from above. × 33.
Fig. 14.—*Micronecta signoreti* (Reut.), ♂. Gonapophyses. × 100.

Micronecta uvarovi, sp. n.

Resembling in shape the preceding species, but much smaller (fig. 15). Pronotal disk and hemelytra brown; posterior portion of the scutellum and scutellar margin of the clavi widely paler; on the clavi and on the coria several longitudinal abbreviated dark stripes ; left membrane pale, the right one interiorly with a slightly curved pale line beginning at the apex of the clavus and extending over the basal third of the length of the membrane. Head, underside, and legs pale yellow ; vertex with an incomplete, reddish, longitudinal median line; ends of intermediate tarsi dark. Frontal arch moderately convex. The length of the head, when seen from above, exceeds slightly half of the length of the pronotal disk, which is a little more than twice as wide as long. The posterior margin of the eyes about one and a half times as long as the lateral margin of the pronotum. Lateral lobes of the prothorax wide, almost quadrangular in shape. Scutellum somewhat shorter than the vertex, its basal margin distinctly longer than the apical ones, the apical angle a little smaller than a right one. Subcostal furrow long, extended posteriorly far behind the middle of the corium. Pala of the male comparatively shorter than in the preceding species, the palar claw somewhat wider. The relative dimensions of the different parts of the intermediate and posterior legs,

---

* Ann. & Mag. Nat. Hist. (9) xiv. pp. 449–451 (1924).
† China, *l. c.*

Fig. 15.

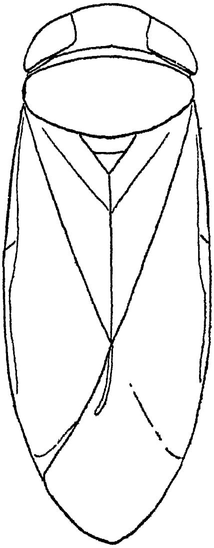


Fig. 16.

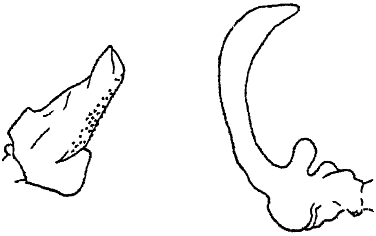


Fig. 15.—*Micronecta uvarovi*, sp. n. Insect seen from above. × 26.
Fig. 16.—Ditto, ♂. Gonapophyses. × 100.

measured in percentages of the length of the corresponding femur, are as follows :—

	Femur.	Tibia.	Tarsus.	Claws.
Int. legs......	100	31·1	46·7	30

	Femur.	Tibia.	Tarsus 1.	Tarsus 2.	Claws.
Post. legs	100	78·6	78·6	35·7	25

Strigili very narrow, bearing indistinct combs situated obliquely on the right side of the sixth abdominal tergite. Gonapophyses of the male shaped as shown in fig. 16. Penis thick.

Length 2·5 mm.

I take the liberty to dedicate this species to Mr. B. P. Uvarov, of the Imperial Bureau of Entomology.

Natal, Weenen, 2840 ft. ; leg. *H. P. Thomasset* ; xi. 1923, "in thorn country," one specimen ; xii. 1923–i. 1924, one specimen ; i. 1924, one specimen, chosen as the type.

LIX.—*New Species of* Halticidæ *from Trinidad and Porto Rico*. By G. E. Bryant, Entomological Assistant, Imperial Bureau of Entomology.

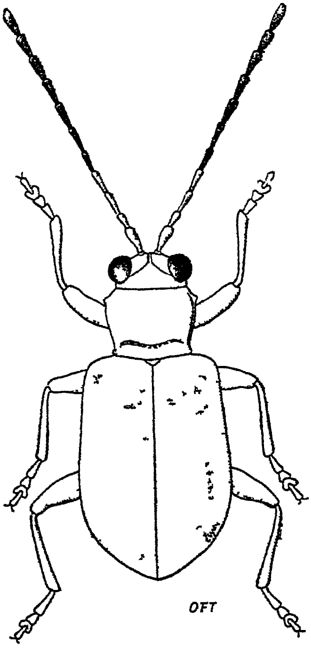
Pseudoepitrix hoffmani, sp. n. (Fig. 1.)

Elongate, more than twice as long as broad, flavous ; antennæ long and slender, extending almost to the apex of the elytra, the last seven joints of the antennæ fuscous ; prothorax subquadrate, impunctate, with a deep transverse sulcus ; elytra nearly twice as long as the head and prothorax together, with a subbasal depression strongly punctate-striate.

L. 2 mm.

Head with the eyes nearly as broad as the prothorax, flavous, impunctate, and perpendicular, the eyes rather prominent, the frontal tubercles not strongly raised and obliquely divided behind ; the antennæ long and slender, extending nearly to the apex of the elytra, flavous, with the seven terminal joints fuscous, the first joint long and somewhat swollen from about middle to apex, not quite equal to the second and third together, the second joint short and rounded, not quite half as long as the first, the third joint about once and a half as long as the second, the third to seventh slender and about equal to each other, the three terminal joints slightly thicker and shorter. Prothorax flavous, a little broader than long, much narrower than the base of the elytra, slightly narrowed towards the base, the sides nearly straight, the anterior angles well marked and oblique, the disc convex, with a deep sinuate transverse sulcus near the base, which is regularly and strongly punctured. Scutellum small and impunctate. Elytra flavous with a slight fuscous tinge near apex, nearly twice as long as head and prothorax together, and much broader at the base than the prothorax, strongly punctate-striate, distinctly depressed near the base and the shoulders well marked. Legs pale flavous and long. Underside flavous with the apical ventral segment paler, the first ventral segment about equal to the following three together, clothed with short scattered pubescence.

Fig. 1.



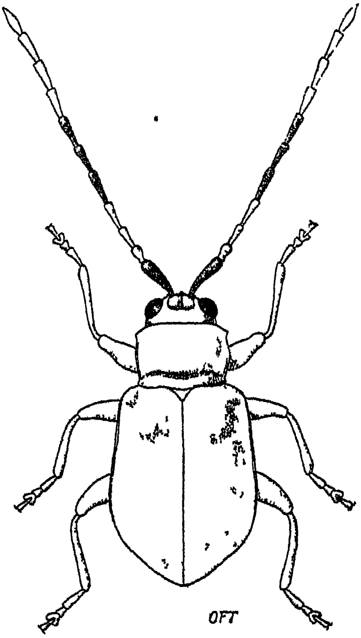
Pseudoepitrix hoffmani, sp n.

Porto Rico: Luguillo Forest, 11. v. 1927, feeding on tree-fern (*Dr. W. A. Hoffman*).

Type in the British Museum.

Closely allied to *P. suffriani*, Jac. (fig. 2), from St. Vincent. Differs in its broader head, the eyes being more prominent, and in the three middle joints of the antennæ not being distinctly black, and in the length of the joints.

Fig. 2.



Pseudoepitrix suffriani, Jac.

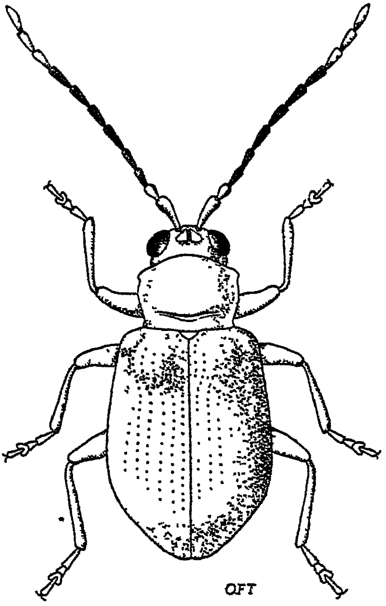
Pseudoepitrix trinitatis, sp. n. (Fig. 3.)

Elongate, a little more than twice as long as broad, castaneous, with the legs, two basal joints and three apical joints of the antennæ flavous; antennæ long, joints 5–8 black; prothorax subquadrate, impunctate, with a deep transverse sulcus; elytra with a subbasal depression, punctate-striate.

L. 2 mm.

Head castaneous, impunctate, the frontal tubercles raised and nearly contiguous, triangular, of slightly paler colour; antennæ long, extending a little beyond the middle of the elytra, the two basal joints flavous, the third and fourth fuscous, fifth to eighth black, the three apical joints flavous, the first joint long, slightly thickened towards the apex, and slightly longer than the second and third together, the third slender and longer than the second, the fourth equal to the third, the fifth to apex slightly thickened and about equal to each other. Prothorax castaneous, a little broader than long, narrowed towards the base, impunctate, the anterior angles well marked and oblique, a deep transverse sinuate sulcus near the base, almost impunctate within. Scutellum castaneous, triangular, impunctate. Elytra castaneous with the shoulders paler, elongate, wider at the base than the prothorax, the basal portion distinctly raised, the shoulders prominent, not strongly punctate-striate, the punctures becoming feebler towards the apex. Legs long and flavous, the posterior metatarsus as long as the following two joints together. Underside castaneous, with the apical ventral

Fig. 3.



Pseudoepitrix trinitatis, sp. n.

segment paler; the first ventral segment the largest, about equal to the second and third together, impunctate.

TRINIDAD: Botanic Gardens, Port of Spain, iv. 1894, destroying the young fronds of a fern, *Adiantum tenerum* (*W. E. Broadway*).

Type in the British Museum.

Differs from *P. suffriani*, Jac. (fig. 2), in its darker colour, joints of the antennæ 5–8 black, shape of frontal tubercles, the transverse sulcus almost impunctate within, and the punctuation of the elytral striæ finer.

LX.—*A Revision of the Frogs of the Genera* Pseudopaludicola, Physalæmus, *and* Pleurodema. By H. W. PARKER, B.A.

(Published by permission of the Trustees of the British Museum.)

IT has long been realised that the South American frogs variously known as *Paludicola* or *Pleurodema* are not a natural genus. Prior to the publication of the second edition of the 'Catalogue of Batrachia Salientia in the British Museum,' various attempts were made to subdivide the assemblage into genera characterised by the presence or absence of vomerine teeth, the presence or absence of an inguinal gland, the shape of the metatarsal tubercles, or similar external characters. Realising that the assemblages so produced were not natural, Boulenger united the various species into one large genus *Paludicola*. Since that time the only attempt to obtain a more natural arrangement was that of Méhely *, who, after examining comparatively few species, proposed uniting those species with vomerine teeth and a simple osseous sternal style as a genus, *Pleurodema*, and those without vomerine teeth but with a bifurcate sternal style as *Paludicola*. This proposal has been followed uncritically by Nieden in 'Das Tierreich' and by various other authors, species having been assigned to one genus or other according to the presence or absence of vomerine teeth. Examination of a large number of species shows, however, that this combination of characters is not constant, several species being referable to the one genus on their vomerine teeth and to the other on the condition of the sternal style.

The material upon which the present revision is based is that preserved in the British Museum, the greater part of the collection of the Museum of Comparative Zoology, Cambridge, Mass., a collection from Bolivia lent by the Museum of Zoology, University of Michigan, and various specimens lent by the Berlin Museum. For these loans the author wishes to express his indebtedness to Dr. Thomas Barbour, Prof. A. G. Ruthven, and Dr. E. Ahl; in addition, thanks are also tendered to Monsieur F. Angel, Dr. A. Jensen, and Dr. Borelli for information and assistance concerning specimens in their charge, and to Major W. P. C. Tenison for his kindness in drawing some of the accompanying text-figures.

---

* Ann. Mus. Nat. Hung. 1904, p. 213.

The following species must be eliminated from the group:—

(1) *Paludicola* [*Liuperus*] *nitidus* (Peters).

Peters, Mon. ber. Ak. Berlin, 1869, p. 878.

A specimen in the British Museum which agrees with the type in all external characters is scarcely distinguishable from the type-specimen of *Tomodactylus amulæ*. Like the latter it also has T-shaped terminal phalanges, cartilaginous sternum and omosternum, and a lumbar gland, and so must be referred to the genus *Tomodactylus*, at least until the position of this genus has been satisfactorily determined.

(2) *Paludicola simonsii*, Boulenger.

Boulenger, Ann. & Mag. Nat. Hist. (7) vi. 1900, p. 182.

Types examined. The omosternum and sternum are cartilaginous, the terminal phalanges T-shaped, vomerine bone toothless in the adult, with a backwardly directed process; in the half-grown type there appear to be two small teeth situated at the end of the posterior vomerine process, but apparently not ankylosed to it. In general appearance and proportions the species is very similar to *Eleutherodactylus unistrigatus*, a species in which the vomerine teeth are small or indistinct. Accordingly "*Paludicola*" *simonsii* must be regarded as an *Eleutherodactylus* without vomerine teeth—*i. e.*, a *Syrrhopus*.

(3) *Paludicola festæ*, Peracca.

Peracca, Boll. Mus. Torino, xix. 465, 1904, p. 32.

Co-type examined. This species has the same osteological characters as the preceding, except that no trace of vomerine teeth has been found. Additional evidence that the species is a *Syrrhopus* is furnished by the eggs; the ovarian eggs of a specimen 27 mm. in length are 2 mm. in diameter. These large eggs suggest a shortened life-history, unknown in "*Paludicola*," but uniformly present, so far as known, in *Syrrhopus*.

(4) *Paludicola imitator*, Barbour & Dunn.

Barbour & Dunn, Proc. Biol. Soc. Washington, xxxiv. 1921, p. 160.

Examination of the unique type, very courteously lent by Dr. Barbour, shows that this species must apparently be referred to the genus *Hyla*. The shoulder-girdle has a cartilaginous sternum and omosternum; there are digital discs with a distinct groove separating the upper and lower surfaces, there is an intercalary phalanx, and the terminal phalanx is claw-shaped. The species appears to be closely allied to *H. eximia*.

The remaining species (thirty-six are here considered as probably valid) may be divided into three groups as follows:—

I. Vomerine teeth absent; vomerine bone without a backwardly directed process; sternum elongate, cartilaginous or calcified; terminal phalanges simple or T-shaped, the digits sometimes with slight terminal dilatations; quadrato-jugal small, not reaching the maxillary. A tubercle under the forearm .. *Pseudopaludicola.*
II. Vomerine teeth usually absent; vomerine bone with a backwardly directed process; sternum with an ossified style; terminal phalanges simple, the digits not dilated; quadrato-jugal reaching forward to the maxillary. No tubercle under the forearm .... *Physalæmus.*
III. Vomerine teeth present or absent; vomerine bone with a backwardly directed process; sternum with an ossified style; terminal phalanges simple, the digits not dilated; quadrato-jugal absent. No tubercle under the forearm .... *Pleurodema.*

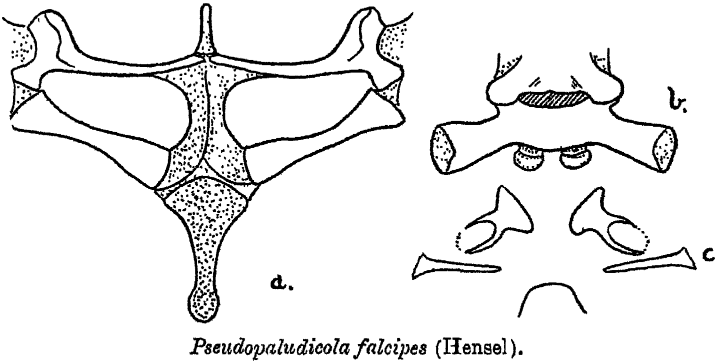
The absolute differences between these three assemblages appear, at first sight, to be trivial; thus the tubercle under the forearm, which is here used to distinguish *Pseudopaludicola* from the other genera, scarcely appears to be of sufficient importance to warrant generic separation. Yet the species included in *Pseudopaludicola* are obviously all very closely allied and very distinct from any of the species included in the other genera. Again, the presence or absence of a quadrato-jugal is the single absolute character which distinguishes *Physalæmus* and *Pleurodema*; yet the members of the former genus are usually of Ranid habitus, without vomerine teeth, with a divided sternal style, and with a tarsal tubercle, whereas the Pleurodemas are usually of Bufonid habitus with vomerine teeth, a single sternal style, and without a tarsal tubercle. It is only the specialised members of each genus which approach the other in one or more characters.

I. Pseudopaludicola, Mir. Ribeiro.

Liuperus, Hensel, Arch. Naturg. xxxiii. 1867, p. 134.
Paludicola (part.), Boulenger, Cat. Batr. Sal. B.M. ed. 2, p. 236 (1882).
Pleurodema (part.), Ruthven, Misc. Pub. Mus. Zool. Michigan, viii. 1922, p. 54.
Pseudopaludicola, Mir. Ribeiro, Arch. Mus. Nac. Rio Janeiro, xxvii. 1926, p. 152.

Pupil horizontal. Tongue oval, entire, free behind. Vomerine teeth absent. Fingers free; toes slightly webbed, fringed; tips of digits simple or very slightly dilated; outer metatarsals united. Vomerine bone without backwardly directed process (fig. 1, *c*); quadrato-jugal small, not reaching the maxillary; omosternum cartilaginous; sternum elongate, cartilaginous or calcified (fig. 1, *a*); sacral diapophyses only very slightly dilated; terminal phalanges simple or T-shaped.

Fig. 1.



Pseudopaludicola falcipes (Hensel).
a, shoulder-girdle; *b*, sacrum; *c*, vomers.

Type-species—*P. falcipes* (Hensel).

The relationships of this genus are not quite clear. All the species examined are closely allied and characterised by a tubercle under the forearm, fringed toes and a dermal fold extending from the inner metatarsal tubercle to the middle of the tarsus. The latter two characters are also present in the genus *Crossodactylus*, which also lacks vomerine teeth, has a cartilaginous or incompletely ossified sternum, T-shaped terminal phalanges, and a short quadrato-jugal. Possibly, therefore, *Pseudopaludicola* may be a dwarfed offshoot from *Crossodactylus* in which the digital discs are undergoing reduction. The discontinuous distribution of this genus (it is unrecorded between S.E. Bolivia and N. Colombia) is probably more apparent than real, and due to our imperfect knowledge of the smaller frogs of the intervening territories.

Synopsis of the Species.

I. Tibio-tarsal articulation reaching beyond the end of the snout .... *P. saltica* (Cope).
II. Tibio-tarsal articulation not reaching the end of the snout.
  A. Terminal phalanges simple; digits not dilated.
    (1) Lower surfaces uniformly white; nostril midway between eye and end of snout. *P. ameghini* (Cope).
    (2) Throat and breast brown-spotted; nostril nearer end of snout than eye .... *P. falcipes* (Hensel).
  B. Terminal phalanges T-shaped; toes with small terminal discs.
    (1) Tibio-tarsal articulation reaching to between the ear and the centre of the eye .... *P. pusilla* (Ruthven).
    (2) Tibio-tarsal articulation reaching the anterior border of the eye or between this point and the end of the snout .. *P. bolivianus*, sp. n.

(1) *Pseudopaludicola saltica* (Cope).

Paludicola saltica, Cope, Proc. Am. Phil. Soc. xxiv. 1887, p. 48; Baumann, Zool. Jahrb. Syst. xxxiii. 1912, pp. 120, 133, 152, 162, Map vi. 4; Nieden, Das Tierreich, Anura i. p. 506 (1923); Mir. Ribeiro, Arch. Mus. Nac. Rio Janeiro, xxvii. 1926, pp. 162, 222.

Known only from the type-specimens from Chapada, Matto Grosso, Brazil.

(2) *Pseudopaludicola ameghini* (Cope).

Paludicola ameghini, Cope, Proc. Am. Phil. Soc. xxiv. 1887, p. 50; Baumann, Zool. Jahrb. Syst. xxxiii. 1912, pp. 129, 133, 152, 162, Map vi. 4; Nieden, Das Tierreich, Anura i. p. 507 (1923); Mir. Ribeiro, Arch. Mus. Nac. Rio Janeiro, xxvii. 1926, pp. 164, 223.

Known only from the type-locality, Chapada, Matto Grosso, Brazil.

(3) *Pseudopaludicola falcipes* (Hensel). (Fig. 1.)

Liuperus falcipes, Hensel, Archiv. Naturg. xxxiii. 1867, p. 134.
Paludicola falcipes, Boulenger, Cat. Batr. Sal. B.M. (2) p. 236 (1882); Ann. & Mag. Nat. Hist. (5) xv. 1885, p. 195; *op. cit.* (5) xviii. 1886, p. 441; Ann. Mus. Civ. Genova, (2) vii. 1889, p. 246; Boettger, Kat. Batr. Mus. Senck. p. 30 (1892); Peracca, Boll. Mus. Torino, cxcv. 1895, p. 25; Berg, An. Mus. Nac. Buenos Aires, v. 1896, p. 178;

Baumann, Zool. Jahrb. Syst. xxxiii. 1912, pp. 143, 145, 146, 152, 162, Map vi. 4; Fernandez, An. Soc. Cient. Argentina, xci. 1921, p. 123, pl. ii. 10, iii. 24; Nieden, Das Tierreich, Anura i. p. 508, 1923; Mertens, Blatt. Aqu. Terr. xxxvi. 1925, p. 8; Mir. Ribeiro, Arch. Mus. Nac. Rio Janeiro, xxvii. 1926, p. 223.

Pseudopaludicola falcipes, Mir. Ribeiro, *tom. cit.* p. 152.

Type-locality. Rio Grande do Sul.

Range. Rio Grande do Sul, Matto Grosso, Uruguay, N. Argentina.

(4) *Pseudopaludicola pusilla* (Ruthven).

Paludicola pusilla, Ruthven, Occ. Pap. Mus. Zool. Michigan, xxx. 1916, p. 1.

Pleurodema pusilla, Ruthven, Misc. Pub. Mus. Zool. Michigan, viii. 1922, p. 54.

This species, in addition to the characters mentioned in the existing descriptions, has T-shaped terminal phalanges, very slightly dilated toes, and a small, conical, dermal papilla on the tibio-tarsal articulation.

Type-locality. Santa Marta Mts., Colombia.

Range. Northern Colombia.

(5) *Pseudopaludicola boliviana*, sp. n.

Type-specimen a ♀, no. 1927. 8. 1. 1 in the British Museum, from Sta. Cruz, Bolivia.

Tongue oval, entire, free behind. Vomerine teeth absent. Snout rounded, not prominent, slightly longer than the diameter of the eye; nostril somewhat nearer the tip of the snout than the eye; interorbital space broader than the upper eyelid; tympanum not visible. Fingers slender, quite free, the first shorter than the second; a tubercle under the forearm; toes slender, slightly dilated distally, with T-shaped terminal phalanges, a slight basal web and lateral dermal fringes; subarticular tubercles well developed; a pair of conical metatarsal tubercles with a fold of skin proceeding from the region of the inner to an indistinct tubercle on the middle of the underside of the tarsus; a small, conical, dermal papilla on the tibio-tarsal articulation; tibio-tarsal articulation reaching the anterior border of the eye when the hind limb is adpressed. Skin irregularly warty above, smooth below; posterior aspect of thighs granular.

Colour in spirit. Brown above, with irregular darker marblings; upper lip lighter, with vertical dark bars; limbs with dark cross-bars; a black, white-stippled, area extending along the hinder side of each thigh from the vent to the knee; lower surfaces uniformly whitish; edge of lower jaw brown speckled.

Length from snout to vent 15 mm. Fore limb 7 mm. Hind limb 22 mm.

The three paratypes exhibit little variation; the tibio-tarsal articulation may reach to between the eye and the tip of the snout, and the skin of the upper surfaces may be quite smooth. Two of the specimens (females) exhibit a broad, median dorsal, white stripe; the third, a male, has a narrow, white, mid-dorsal stripe, unpigmented breeding-pads on the upper and inner surfaces of the first finger, and a single subgular vocal sac opening to the mouth by a slit on each side of the tongue.

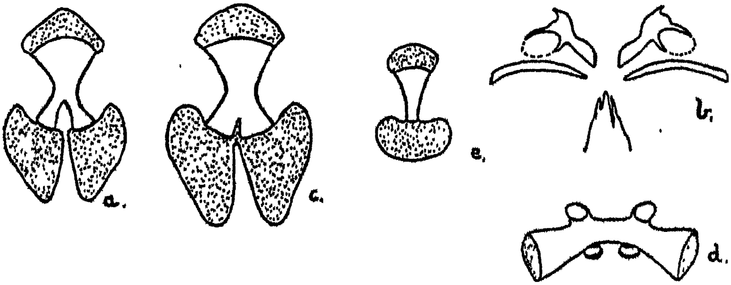
This species is very closely allied to *P. pusilla* (Ruthven), being only distinguishable by its rather more slender form, slightly larger eyes, and longer hind limbs.

II. Physalæmus, Fitzinger.

Bufo (part.), Spix, Spec. Test. Ran. Braz. p. 47 (1824).
Physalæmus, Fitzinger, Neue Class Rept. pp. 39, 65 (1826).
Paludicola, Wagler, Syst. Amph. p. 206 (1830).
Rhinoderma, Girard, U.S. Explor. Exped. p. 71 (1858).
Gomphobates, Reinhardt & Lütken, Vid. Meddel. xiii. 1862, p. 171.
Eupemphix (part.), Steindachner, Verh. Ges. Wien, xiv. 1864, p. 271.
Nattereria, Steindachner, *tom. cit.* p. 279.
Lystris (part.), Cope, Proc. Acad. Philad. 1868, p. 312.
Pleurodema (part.), Espada, Vert. Viaje Pacif. Batr. p. 87 (1875).

Pupil horizontal. Tongue elliptical, entire and free behind. Vomerine teeth usually absent; when present between the choanæ. Fingers free; toes free or very slightly webbed, often fringed; tips of digits not dilated.

Fig. 2.



a, sternum of *Physalæmus cuvieri*, Fitz.; *b*, vomers of ditto; *c*, sternum of *Physalæmus gracilis* (Boulenger); *d*, sacrum of ditto; *e*, sternum of *Physalæmus barbouri*, sp. n.

Outer metatarsals united. Vomerine bone with a backwardly directed process (fig. 2, *b*); quadrato-jugal present, forming a suture with the maxillary; omosternum cartilaginous; sternum with a bony style which is often furcate posteriorly (fig. 2, *a*, *c*, & *e*); sacral diapophyses slightly dilated; terminal phalanges simple.

The genus *Physalæmus* was erected by Fitzinger for a single species, *P. cuvieri.* The description given is brief and in key form, but was probably quite diagnostic at the time it was written; though only given as a generic description it must necessarily be also a description of the unique species in the genus, and consequently both generic and specific names are valid.

In osteological characters the members of this genus show great resemblances to *Edalorhina* and *Eupemphix*; Nieden *, indeed, has gone so far as to refer the species of the former to his genera *Paludicola* and *Pleurodema*, because there is no osteological character which will separate them. *Edalorhina plicifrons* (Cope) lacks vomerine teeth, as do all species of *Physalæmus* with a single doubtful exception (*P. biligonigerus*); nevertheless, the various species of *Edalorhina* form a natural assemblage, characterised by their peculiar dermal processes on the upper eyelid, and appear to be more closely allied to one another than to any of the species of *Physalæmus*. *Edalorhina* may well be an offshoot from the Leptodactylid stock, which gave rise, by a reduction of the vomer and ultimate loss of the vomerine teeth, to *Physalæmus*; certainly the two are very closely related. *Eupemphix*, as has already been pointed out by various authors, is directly derivable from some primitive *Physalæmus* (with an undivided sternal style) by the simple loss of the maxillary teeth.

Synopsis of the Species.

I. Vomerine teeth present; tarsal tubercle present, metatarsal tubercles compressed.................................. *P. biligonigerus* (Cope).

II. Vomerine teeth absent; tarsal tubercle present. Sternal style bifurcate or single.

  A. Metatarsal tubercles strongly compressed, shovel-shaped. Sternal style bifurcate.

    (1) Inguinal gland present. No tubercle on the tibio-tarsal articulation... *P. fuscomaculatus* [(Steindachner).

    (2) Inguinal gland absent. A tubercle on the tibio-tarsal articulation.... *P. albifrons* (Spix).

---

* 'Das Tierreich,' Anura i. (1923).

B. Metatarsal tubercles not shovel-shaped; if compressed only slightly so.
(1) Sternal style furcate, or if single the xiphisternal cartilage divided or deeply indented posteriorly; moderately large species.
(*a*) Inner metatarsal tubercle closer to the outer metatarsal than to the tarsal tubercle.
(*α*) No lumbar black spot; often a spot on either side of the coccyx, which is not covered by the folded hind limbs; sternal style strongly bifurcate. *P. cuvieri*, Fitz.
(*β*) A black lumbar spot, which is covered by the folded hind limbs, usually present. Sternal style not distinctly bifurcate . *P. gracilis* (Bouleng.).
(*b*) Inner metatarsal tubercle less distant from the tarsal than from the outer metatarsal tubercle .. *P. bischoffi* (Bouleng.).
(2) Sternal style single; xiphisternal cartilage not indented posteriorly; small species.
(*a*) Snout as long as the orbital diameter. Metatarsal tubercles reaching beyond the end of the snout when the hind limb is adpressed .... *P. henseli* (Peters).
(*b*) Snout longer than the orbital diameter. Metatarsal tubercles not reaching end of snout.
(*α*) Snout 1¾ diameter of eye; loreal region concave .... *P. fernandezæ* (Müller).
(*β*) Snout only slightly longer than eye; loreal region not concave...................... *P. barbouri*, sp. n.
III. Vomerine teeth absent. No tarsal tubercle. Sternal style single.
A. A lumbar ocellus; a fold along the tarsus; metatarsus with four rows of small tubercles .... *P. bresslaui* (Müller).
B. No lumbar ocellus, no tarsal fold or the merest trace; metatarsus smooth. *P. olfersi* (Licht. & Mart.).

1. *Physalæmus biligonigerus* (Cope).

Liuperus biligonigerus, Cope, Proc. Acad. Philad. 1860, p. 517; Méhely, Ann. Mus. Nat. Hungary, ii. 1904, p. 211, footnote.
Pleurodema biligonigera, Cope, *op. cit.* 1862, p. 352; Méhely, *tom. cit.* p. 212; Nieden, Das Tierreich, Anura i. p. 500 (1923).
Gomphobates biligonigerus, Cope, Proc. Am. Phil. Soc. xi. 1869, p. 168.
Paludicola biligonigera (part.), Bouleng. Cat. Batr. Sal. B.M. ed. 2, p. 234 (1882).
Paludicola signifera (part.), Boulenger, Ann. & Mag. Nat. Hist. ser. 6, viii. 1891, p. 454; Berg, An. Mus. Nac. Buenos Aires, v. 1896, p. 173.

The status of this species is doubtful; both Méhely and Nieden have pointed out that Boulenger was probably in error in referring it to the synonymy of *P. signifera* (=*P. cuvieri* of this paper) and state that, as it was referred to the genus *Pleurodema* by Cope, it must have possessed vomerine teeth. Cope himself, in referring the species to the genus *Pleurodema* (1862), states that the original specimen had the "vomerine teeth and lumbar gland obliterated," but that in a second specimen the lumbar gland is black ; though there is no definite statement of their occurrence, the implication seems to be that vomerine teeth are also present in this second specimen. In all other characters, however, the description agrees fairly well with specimens of *P. fuscomaculatus*. Accordingly, the species must be regarded as distinct and closely allied to *P. fuscomaculatus*, but distinguished by the presence of vomerine teeth.

Type-locality. Buenos Aires.

2. *Physalæmus fuscomaculatus* (Steindachner).

Leiuperus marmoratus (non Dum. & Bibr.), Burmeister, Reise La Plata, ii. p. 532 (1861).

Eupemphix fuscomaculatus, Steindachner, Verh. zool-bot. Ges. Wien, 1864, p. 272, pl. xiii. fig. 3.

Eupemphix nattereri (part.), Steindachner, *loc. cit.* p. 271.

Lystris fuscomaculata, Cope, Proc. Ac. Philad. 1868, p. 312.

Gomphobates fuscomaculata, Steindachner, Reise Novara, Amph. p. 12 (1869).

Gomphobates marmoratus (non Dum. & Bibr.), Steindachner, *loc. cit.*

Pleurodema granulosum, Espada, Viaj. Pacif. Vert. p. 95, pl. i. fig. 6 (1875).

Paludicola fuscomaculata, Boulenger, Cat. Batr. Sal. B.M. ed. 2, p. 233 (1882) ; Ann. & Mag. Nat. Hist. (5) xvi. 1885, p. 88 ; *op. cit.* (5) xviii. 1886, p. 440 ; *op. cit.* (5) xx. 1887, p. 296 ; Ann. Mus. Civ. Genova, vii. 27, 1889, p. 246 ; Ann. & Mag. Nat. Hist. (6) xiii. 1894, p. 248 ; Boettger, Zeitschr. f. Naturw. lviii. 1885, p. 243 ; Berg, An. Mus. Nac. Buenos Aires, v. 1896, p. 172 ; Peracca, Boll. Mus. Torino, xii. 1897, no. 274, p. 16 ; Gadow, Camb. Nat. Hist. viii. p. 220, fig. (1901) ; Méhely, Ann. Mus. Nat. Hung. ii. 1904, p. 214 ; Bles, in works of J. Samuel Budgett, p. 207 (1907) ; Baumann, Zool. Jahrb. Syst. 1912, pp. 143, 145, 146, 152, 162, Map vi. 4 ; Fernandez, An. Soc. Cient. Argentina, xci. 1921, p. 114, pls. i. 2 & 3, ii. 2, iii. 18 ; Nieden, Das Tierreich, Anura i. p. 504, fig. (1923) ; Marelli, Elenc. Sist. Fauna Buenos Aires, p. 585 (1924) ; Noble, Am. Mus. Novit. clxv. 1925, p. 2 ; Miranda Ribeiro, Arch. Mus. Nac. Rio Janeiro, xxvii. 1926, pp. 159 & 221, fig. ; Mertens, Blatt. Aqu. & Terr. 1926, vii. p. 1, fig.

? *Gomphobates marmoratus*, Reinhardt & Lütken, Vid. Meddel. xiii. 1862, p. 175, pl. iv. fig. 4.

? *Gomphobates marmoratus*, Hensel, Arch. Naturg. 1867, p. 137.

Paludicola albifrons (part.), Boulenger, Cat. Batr. Sal. B.M. ed. 2 p. 234 (1882) ; Ann. & Mag. Nat. Hist. ser. 5, xx. 1887, p. 295

? Berg, An. Mus. Buenos Aires, v. 1892, p. 175; ? Baumann, Zool. Jahrb. Syst. 1912, pp. 129, 134, 143, 151, 162, Map vi. 4; Nieden, Das Tierreich, Anura i. p. 503 (1923); ? Marelli, Elenc. Sis. Fauna Buenos Aires, p. 585 (1924).

This species exhibits great variation in colouring, and, since the lumbar glands are often not distinctly pigmented, it has, apparently, often been confused with the following species.

Miranda Ribeiro has stated that vomerine teeth are present, though indistinct, in this species; over 100 specimens from various localities have been examined by the author, and in none was any trace of vomerine teeth found. It seems possible that Miranda Ribeiro's specimens were really *P. biligonigerus*.

Type-locality. Caicara, near S. Luiz de Caceres, Matto Grosso.

Range. From São Paulo southwards to Buenos Aires and eastwards to Bolivia.

3. *Physalæmus albifrons* (Spix).

Bufo albifrons, Spix, Spec. Test. Ran. Bras. p. 48, pl. xix. fig. 2 (1824); Peters, Mon. Berlin. Ak. 1872, p. 222.

Paludicola albifrons, Peters, *tom. cit.* p. 227; Boulenger (in part.), Cat. Batr. Sal. B.M. ed. 2, p. 234 (1882); Méhely, An. Mus. Hung. ii. 1904, p. 215; Baumann, Zool. Jahrb. Syst. 1912, pp. 138, 151, 162, Map vi. 4; Mir. Ribeiro (in part.), Arch. Mus. Nac. Rio Janeiro, xxvii. 1926, pp. 159 & 221.

Méhely has re-examined the types of this species and states that they differ from *P. fuscomaculatus* in possessing a second tarsal tubercle, larger than the first, situated near the tibio-tarsal articulation, and in having no externally visible lumbar glands. In *P. fuscomaculatus* the black ocellus on the lumbar gland is sometimes wanting, and it appears probable that such specimens have been frequently recorded as *P. albifrons*. Thanks to the kindness of Dr. Ahl, I have been privileged to examine the two specimens (a male and a young) from Porto Alegre from which Boulenger drew up his re-description of "*P. albifrons*"*. The male possesses but one tarsal tubercle, and, though the lumbar ocellus is poorly defined, I am unable to distinguish the specimen from *P. fuscomaculatus*; the young is apparently *P. cuvieri*, there being no lumbar gland, no second tarsal tubercle, and the metatarsal tubercles not being at all compressed. Again, Dr. Jensen has at my request examined the types of *Gomphobates marmoratus*, Reinh. & Lütk., a species previously referred to the synonymy of *P. albifrons*, and he informs me that there is only one tarsal tubercle, and that lumbar glands are externally visible; it appears probable, therefore, that these specimens are really *P. fuscomaculatus*. All records of "*P. albifrons*," except the type, are from localities within the known range of *P. fuscomaculatus**; the type-locality of *P. albifrons* is well outside this area. As it appears improbable that so many workers would have failed to notice a second tarsal tubercle on their specimens, all records of "*P. albifrons*" from within the range of *P. fuscomaculatus* have referred provisionally to the latter species.

---

* Ann. & Mag. Nat. Hist. ser. 5, xx. 1887, p. 295.

Type-locality. Province of Bahia, Brazil.

4. *Physalæmus cuvieri*, Fitz. (Fig. 2, *a* & *b*.)

Physalæmus cuvieri, Fitzinger, N. Class. Rept. p. 65 (1826).
Rhinoderma signifera, Girard, Proc. Ac. Philad. vi. 1853, p. 424; U.S. Explor. Exped., Herpet. p. 72 (1858).
Gomphobates notatus, Reinhardt & Lütken, Vid. Meddel. 1861, p. 173, pl. iv. fig. 3.
Gomphobates kroyeri, Reinh. & Lütk. *tom. cit.* p. 176.
Leiuperus albonotatus, Steindachner, Verh. zool-bot. Ges. Wien, 1862, pp. 272 & 551, pl. xvi. fig. 4.
Leiuperus ephippifer, Steindachner, *tom. cit.* p. 277, pl. xiv. fig. 1 & pl. xvi. fig. 5.
Paludicola notata, Peters, Mon. Ak. Berlin, 1872, p. 223.
Paludicola biligonigera, Boulenger, Cat. Batr. Sal. B.M. p. 234 (1882) (in part.); Baumann, Zool. Jahrb. Syst. 1912, pp. 116, 122, 129, 143, 144, 151, 162, Map vi. 4.
Paludicola kroyeri, Boulenger, *op. cit.* p. 235; Baumann, *tom. cit.* pp. 116, 122, 129, 138, 140, 151, 162, Map vi. 4.
Paludicola signifera, Boulenger, Ann. & Mag. Nat. Hist. (6) viii. 1891, p. 454 (in part.); Boettger, Kat. Mus. Senck. p. 30 (1892) (in part.); Peracca, Boll. Mus. Torino, cxcv. 1895, p 25; Berg, An. Mus. Nac. Buenos Aires, v. 1896, p. 175 (in part.); Méhely, Ann. Mus. Hung. ii. 1896, p. 211, pl. xiii. fig. 6; Nieden, Das Tierreich, Anura i. p. 505 (1923); Mir. Ribeiro, Arch. Mus. Nac. Rio Janeiro, xxvii. 1926, pp. 160 & 221, fig. 89.
Paludicola signifer, Baumann, *tom. cit.* pp. 129, 143, 144, 151, 152, 162, Map vi. 4.
Paludicola albifrons (in part.), Boulenger, *op. cit.* (5) xx. 1887, p. 295.
Paludicola gracilis (non Boulenger, 1883), Boulenger, *op. cit.* (6) xiii. 1894, p. 348.
Paludicola neglecta, Ahl, Zool. Anz. lxix. 1927, p. 224.

This, the type-species, is perhaps also the most variable species of the genus. The majority of the variations have already been adequately described, and it only remains to add the following remarks. The black sacral spots which are so characteristic of the majority of specimens are not uniformly present as has been stated; the position of the tarsal tubercle relative to the metatarsal tubercles also varies considerably. In many specimens it is equidistant with the outer metatarsal tubercle from the inner, and so approaches the condition of *P. bischoffi*—in fact, the probability is that the latter species will prove to have been founded on an aberrant *P. cuvieri*. Through the kindness of Dr. Ahl a co-type of *P. neglecta*, Ahl, has been examined; it appears to be really a young specimen of the present species.

---

* Baumann (*loc. cit. supra*) records *P. albifrons* as absent from Minas Geraes on p. 143, but on p. 162 as present; the latter record is probably an error.

Type-locality. Brazil.

Range. Brazil, Uruguay, Paraguay, E. Bolivia, and N. Argentina.

5. *Physalæmus gracilis* (Bouleng.). (Figs. 2, *c*. & *d*.)

Gomphobates notatus (non Reinhardt & Lütken), Hensel, Arch. Naturg. 1867, p. 138.

Paludicola gracilis, Boulenger, Ann. & Mag. Nat. Hist. (5) xi. 1883, p. 17; *op. cit.* (5) xv. 1885, p. 195; *op. cit.* (5) xvi. 1885, pp. 296 & 298; *op. cit.* (5) xviii. 1886, p. 441; Boettger, Zeit. f. Naturwiss. lviii. 1885, p. 32; Kat. Batr. Mus. Senck. p. 30 (1892); Cope, Bull. U.S. Nat. Mus. xxxiv. 1889, p. 239; Peracca, Bol. Mus. Torino, clix. 1895, p. 25; Berg, An. Mus. Nac. Buenos Aires, 1896, p. 177; Baumann, Zool. Jahrb. Syst. 1912, pp. 143, 145, 152, 162, Map vi. 4; Nieden, Das Tierreich, Anura i. p. 506 (1923); Marelli, Elenc. Sist. Fauna, Buenos Aires, p. 585 (1924); Mertens, Blatt. Aqu. Terr. xxxvi. 1, 1925, p. 2; Mir. Ribeiro, Arch. Mus. Nac. Rio Janeiro, xxvii. 1926, pp. 160 & 222.

Paludicola ranina, Cope, Proc. Am. Phil. Soc. xxii. 1885, p. 186.

? *Paludicola fischeri*, Boulenger, Proc. Zool. Soc. 1890, p. 327, pl. xxv. fig. 2; Nieden, Das Tierreich, Anura i. (1923).

? *Paludicola olfersi* (non Licht. & Mart.), Berg. *tom. cit.* p. 176.

? *Liuperus calcaratus*, Philippi, Sup. Batr. Chil. p. 51 (1902).

This species exhibits a considerable amount of variation in colour, and frequently closely resembles the preceding; the black lumbar spots may be entirely absent in young specimens, and the lower surface, which is frequently heavily mottled with brown, often shows a clear median line on the chin and throat. This latter character does not appear to occur in *P. cuvieri*, and is thus of diagnostic value when present. Mir. Ribeiro's statement (*loc. cit. supra*) that this species closely resembles *P. falcipes*, Hensel, is misleading; any resemblance there may be is quite superficial, Hensel's species being, as M. Ribeiro himself realised, generically distinct.

P. fischeri, Boulenger, described from a single specimen stated to have been collected in Venezuela, is probably synonymous with *P. gracilis*. I have been unable to find any character by which to distinguish the two, and have been unable to confirm the locality.

Type-locality. Rio Grande do Sul.

Range. Rio Grande do Sul, Sta. Catharina, Parana, Uruguay, N. Argentina.

6. *Physalæmus bischoffi* (Bouleng.).

Paludicola bischoffi, Boulenger, Ann. & Mag. Nat. Hist. (5) xx. 1887, p. 296; Baumann, Zool. Jahrb. Syst. 1912, pp. 143, 152, 162, Map vi. 4; Nieden, Das Tierreich, Anura i. p. 508 (1923); Mir. Ribeiro, Arch. Mus. Nac. Rio Janeiro, xxvii. 1926, pp. 163 & 222.

As stated above, this species may be found to be synonymous with *P. cuvieri.* Known only from the type-locality, Rio Grande do Sul.

7. *Physalæmus henselii* (Peters).

Gomphobates kroyeri? (non Reinhardt & Lütken), Hensel, Arch. Naturg. 1867, p. 139.

Paludicola henselii, Peters, Mon. Ak. Berlin, 1872, p. 223.

Paludicola henseli, Boulenger, Cat. Batr. Sal. B.M. ed. 2, p. 235 (1882); Ann. & Mag. Nat. Hist. (5) xx. 1887, p. 296; Baumann, Zool. Jahrb. Syst. 1912, pp. 143, 145, 152, 162, Map vi. 4; Nieden, Das Tierreich, Anura i. p. 508 (1923); Mir. Ribeiro, Arch. Mus. Nac. Rio Janeiro, xxvii. 1926, pp. 163 & 222.

Type-locality. Rio Grande do Sul.

Range. Rio Grande do Sul.

8. *Physalæmus fernandezæ* (Müller).

Paludicola fernandezæ, L. Müller, Zool. Anz. lxv. 1926, p. 193.

Known only from the type-specimen from Christiano Muerto, Argentina.

9. *Physalæmus barbouri*, sp. n. (Fig. 2, *e.*)

Type-specimen a ♀, no. 1913. 9. 10. 48 in the British Museum, collected at "La Plata" by Dr. Spegazzini in 1887.

Tongue elliptic, entire, and free behind. Vomerine teeth none. Snout slightly depressed and slightly prominent, rather longer than the diameter of the eye; interorbital space broader than the upper eyelid. Tympanum not visible. Fingers short, first much shorter than second; toes short with a rudiment of web and indications of lateral fringes; subarticular tubercles distinct; a small tubercle on the middle of the tarsus; two small, oval, metatarsal tubercles. Tibio-tarsal articulation of the adpressed hind limb reaches the shoulder, the metatarsal tubercles attaining the eye. Above with irregular glandular warts; no lumbar gland; skin smooth beneath; hinder side of thighs granular.

Colour in spirit. Upper surface of head and mid-dorsal area pale brown, this area being bounded by an irregular dorso-lateral dark brown streak which extends from the supraciliary edge to the groin; flanks dark brown, the colour merging with that of the dorso-lateral stripe. A dark line along the loreal region, through the eye to the shoulder, bounded below in its posterior half (from the eye) by lighter. Limbs indistinctly cross-banded. Beneath dirty white marbled with brown.

Length from snout to vent 19 mm.

The five paratypes exhibit no important variation in proportions, but exhibit some variations in colour; the flanks are frequently as light as the mid-dorsal area, and the dorso-lateral dark streak is broken up into an irregular row of dark blotches. One ♀ has a narrow white stripe from snout to vent, and one half-grown individual lacks the light mid-dorsal area; in the latter specimen the upper surface is marked with large irregular dark brown spots, the most prominent of which are a triangular one between the eyes, and two on the middle of the back, which enclose a small, round, light area between them.

The males have paired subgular vocal sacs which are visible externally as a folded and deeply pigmented region along the sides of the gular region, and which open into the mouth by a long slit on each side of the tongue; the second finger is somewhat dorso-ventrally flattened, and dark brown "breeding-pads" are present at the base of and on the first finger only.

This species is allied to *P. henseli*, but is distinguished by the rather longer snout, shorter fingers and toes, much shorter hind limbs, and the absence of a white, dark-bordered streak on the upper jaw.

10. *Physalæmus bresslaui* (L. Müller).

Paludicola bresslaui, L. Müller, Senckenbergiana, vi. 1924, p. 175.

Known only from the type-specimen from Therezopolis, Rio de Janeiro.

11. *Physalæmus olfersi* (Licht. & Mart.).

Phryniscus olfersi, Lichtenstein & Martens, Nomencl. Rept. Mus. Berolin, p. 40 (1856).

Nattereria lateristriga, Steindachner, Verh. zool.-bot. Ges. Wien, 1864, p. 279, pl. xiv. fig. 2; Boulenger, Cat. Batr. Sal. B.M. ed. 2, p. 273 (1882); Baumann, Zool. Jahrb. Syst. 1912, pp. 137, 138, 139, 153, 162, Map vi. 5.

Paludicola olfersi, Peters, Sitzber. Ges. Natf. Fr. Berlin, 1882, p. 62; Boulenger, Ann. & Mag. Nat. Hist. (5) xx. 1887, p. 297; Baumann, *op. cit.* pp. 114, 144, 151, 162, Map vi. 4; Nieden, Das Tierreich, Anura i. p. 509 (1923); Mir. Ribeiro, Arch. Mus. Nac. Rio Janeiro, xxvii. 1926, pp. 161 & 222, fig.

Examination of several specimens, including a co-type, discloses no differences from the published descriptions, except from that of Berg*, which states that the tarsal tubercle is well developed. As there is only the faintest trace of such a tubercle in the specimens examined, and all other authors have insisted on its absence, it seems probable that Berg's specimen was not really referable to this species; it has been placed provisionally with *P. gracilis*.

Type-locality. Brazil.

Range. From Rio de Janeiro to Sta. Catharina.

The following species are not sufficiently well defined to enter into the system, though probably referable to this genus:—

? 12. *Physalæmus mystacalis* (Cope).

Paludicola mystacalis, Cope, Proc. Am. Phil. Soc. xxiv. 1887, p. 49; Baumann, Zool. Jahrb. Syst. 1912, pp. 129, 133, 162, Map vi. 4; Nieden, Das Tierreich, Anura i. p. 507 (1923); Mir. Ribeiro, Arch. Mus. Nac. Rio Janeiro, xxvii. 1926, pp. 163, 222.

Known only from the type-locality, Chapada, Matto Grosso.

? 13. *Physalæmus coquimbensis* (Philippi).

Pleurodema coquimbensis, Philippi, Sup. Batr. Chili, p. 129 (1902); Nieden, Das Tierreich, Anura i. p. 501 (1923).

Known only from the type-locality, near Serena, Chili.

III. Pleurodema, Tschudi.

Pleurodema, Tschudi, Classif. Batr. p. 84 (1838).
Cystignathus (part.), Dum. & Bibr. Erpet. Gen. viii. p. 392 (1841).
Leiuperus, Dum. & Bibr. *tom. cit.* p. 420.
Physalæmus (non Fitz., 1826), Fitzinger, Syst. Rept. i. p. 31 (1843).
Lystris (part.), Cope, Proc. Ac. Philad. 1868, p. 312.

Pupil horizontal. Tongue subcircular or oval, free and entire, or slightly nicked posteriorly. Vomerine teeth present or absent; when present between the choanæ. Fingers free; toes webbed or free, often fringed; tips of digits not dilated. Outer metatarsals united. Vomerine bone with a backwardly directed process (fig. 3, *c*); quadrato-jugal reduced or absent, not reaching the maxillary; omosternum cartilaginous; sternum with a bony style, which is usually single, sometimes furcate posteriorly; sacral diapophyses slightly dilated, terminal phalanges simple.

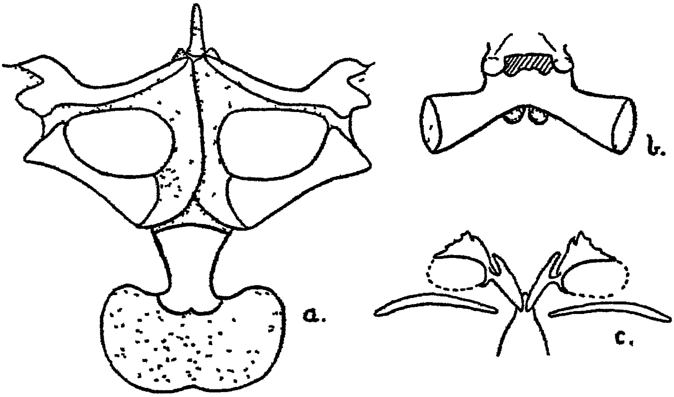
---

* An. Mus. Nac. Buenos Aires, v. 1896, p. 176.

Type-species—*P. bibroni*, Tschudi.

In the possession of vomerine teeth by more than half the species this genus is more primitive than the preceding, but cannot be regarded as ancestral to it in any way, as the reduced quadrato-jugal must be regarded as a secondary character. That the two are genetically related seems probable from the number of characters they have in common and the same evolutionary tendencies which appear in both; both have an osseous sternal style which tends to divide posteriorly; the vomerine bone is similar in both genera, the teeth tending to become obsolete; many species in both genera have glandular complexes in the inguinal region, and a tarsal tubercle, almost universally present in *Physalæmus*, appears also in *Pleurodema*. The latter genus may, perhaps, be regarded as a parallel offshoot from the Leptodactylid stock which gave rise to *Physalæmus*.

Fig 3



Pleurodema marmorata (Dum. & Bibr.).
a, shoulder-girdle; *b*, sacrum; *c*, vomers.

Synopsis of the Species.

I. Vomerine teeth present. Sternal style single.
  A. No tubercle on the tarsus.
    (1) No lumbar gland.
      (*a*) Tympanum not visible, 1st and

2nd fingers subequal; metatarsal tubercles not shovel-shaped. .. *P. illota* (Barbour).

(*b*) Tympanum distinct; 1st finger longer than 2nd; metatarsal tubercles shovel-shaped ...... *P. tucumana*, sp. n.

(2) Lumbar gland present.

(*a*) Lumbar gland large and flat, considerably longer than the snout; toes webbed; ♂ without vocal sacs .... *P. bufonina*, Bell.

(*b*) Lumbar gland moderate and rounded, as long as the snout or but slightly longer; toes not webbed; male with a pair of subgular vocal sacs opening by a long slit on either side of the tongue.

(*α*) Metatarsal tubercles not large and shovel-shaped; reaching beyond eye when the hind limb is adpressed.

* Tympanum visible .. .. *P. cinerea*, Cope.

** Tympanum concealed ...... *P. bibroni*, Tschud.

(*β*) Metatarsal tubercles large and shovel-shaped; not reaching beyond eye when hind limb is adpressed .... *P. brachyops* (Cope).

B. A tubercle near the tibio-tarsal joint; no lumbar gland; metatarsal tubercles shovel-shaped................ *P. diplolistris* (Peters).

II. Vomerine teeth absent; no tarsal tubercle.

A. A lumbar gland; sternal style single.. *P. darwinii*, Bell.

B. No lumbar gland.

(1) Snout as long as the orbital diameter; metatarsal tubercles not compressed.

(*a*) Interorbital space narrower than the upper eyelid. Eyes large and prominent .... *P. sagittifer* (Schmidt).

(*b*) Interorbital space as broad as the upper eyelid. Eyes not particularly prominent.

* Toes slightly webbed.

† Toes with dermal fringes; tympanum indistinct; nostril equidistant from eye and end of snout .... *P. marmorata* (Dum. & Bibr.).

†† Toes without dermal fringes, though webbed at the base; tympanum distinct; nostril nearer end of snout than eye.. *P. mexicana* (Brocchi).

** Toes without any trace of webbing or dermal fringes ...... *P. verrucosa* (Reinh. & Lütk.).

(2) Snout shorter than orbit; sternal style divided; metatarsal tubercles compressed, shovel-shaped ...... *P. nebulosa* (Burmeister).

1. *Pleurodema illota* (Barbour).

Paludicola illotus, Barbour, Proc. Biol. Soc. Washington, xxxv. 1922, p. 113.

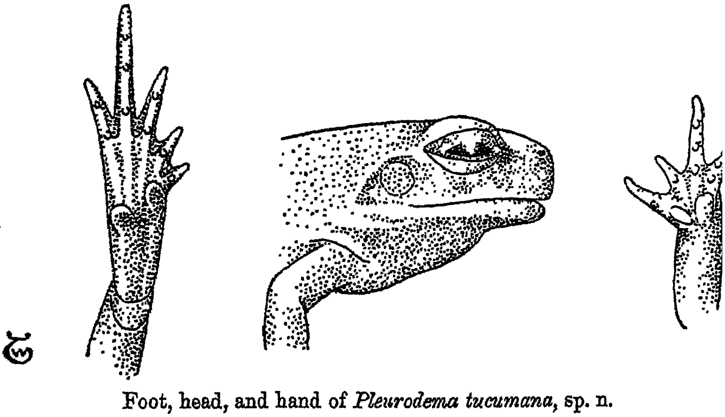
Known only from the type-locality, West of Mendoza, Argentina, 7000 feet.

2. *Pleurodema tucumana*, sp. n. (Fig. 4.)

Type-specimen a ♂, no. 1902. 7. 29. 75 in the British Museum, from Tapia, Tucuman, Argentina, 2300 feet.

Tongue subcircular, entire. Vomerine teeth present, in two small oblique groups between the choanæ. Snout short, vertically truncate in profile, as long as the greatest diameter of the eye; nostril nearer the tip of the snout than the eye; interorbital space as broad as the upper eyelid; tympanum distinct, half the diameter of the eye. Fingers short, the first considerably longer than the second, which is distinctly depressed; toes rather short with a rudiment of web and with distinct dermal fringes; subarticular tubercles moderate; two large, compressed, shovel-shaped metatarsal tubercles; no tarsal tubercle; tibio-tarsal articulation of the adpressed hind limb reaching the posterior border of the orbit. Skin smooth above and below; no externally perceptible lumbar gland; hinder side of thighs granular.

Fig. 4.



Foot, head, and hand of *Pleurodema tucumana*, sp. n.

Colour in spirit. Above pale brown with indistinct and irregular darker marblings; traces of a W-shaped mark on the anterior part of the back and indications of a dark cross-band between the eyes, a dark canthal streak and a dark bar on the upper lip below the eye; inguinal region with irregular dark brown spots; limbs with indistinct dark brown cross-bars. White beneath, the gular region infuscate.

Male with two external subgular vocal sacs opening by a long slit on each side of the tongue and two dark brown "breeding-pads" on the base and outer side of the first fingers.

Length from snout to vent 38 mm.

Fore limb 19 mm. Hind limb 48 mm.

The paratypes consist of two males and one female from the type-locality, two males from Los Bosques, near Tucuman, and two young from Laguna de Malvinas, near Tucuman. They exhibit but little variation; the tibio-tarsal articulation may only attain the tympanum when the hind limb is adpressed; the depressed second finger is apparently a male secondary sexual character, and the tympanum may be as large as two-thirds the diameter of the eye. The females are considerably larger than the males (44 mm. from snout to vent) with ovarian eggs of about 1 mm. diameter.

This new species is, apparently, quite closely allied to *P. illota* (Barbour), differing from it in the distinct tympanum, the longer first finger, and the large metatarsal shovels. *P. diplolistris*, *P. brachyops*, and *P. tucumana*, the three species with large compressed metatarsal tubercles, have the same habitus and very similar colouring. The presence of a tarsal tubercle in *diplolistris* and a lumbar gland in *brachyops* would, however, appear to preclude any probability of their being more closely allied to each other than to other members of the genus, and so it must be concluded that their resemblances are due to adaptation to similar habitats.

3. *Pleurodema bufonina*, Bell.

Pleurodema bufonina, Bell, Zool. Voy. 'Beagle,' v. p. 39, pl. xvii. fig. 5 (1843); Nieden, Das Tierreich, Anura i. p. 495 (1923).

Paludicola bufonina, Burmeister, Ann. Mus. Nac. Buenos Aires, iii. 1888, p. 251; Stejneger, Rep. Princetown Univ. Exped. Patag., Zoology, iii. 1909, p. 215.

Leiuperus salarius, Bell, *op. cit.* p. 39, pl. xviii. figs. 1 & 1 *a*; Günther, Cat. Batr. Sal. B.M. p. 22 (1858).

Pleurodema bufonium, Günther, *op. cit.* p. 31.

Paludicola bufonia. Boulenger, Cat. Batr. Sal. B.M. ed. 2, p. 230, fig. (1882); Koslowsky, Rev. Mus. La Plata, vi. 1895, p. 300; Berg, An. Mus. Nac. Buenos Aires, v. 1896, p. 169; Anderson, Vet.-Ak Stockholm, vii. 1891, p. 462.

The series of specimens examined shows little variation from the published descriptions; the tympanum is sometimes visible, and the male lacks vocal sacs. The variation in the degree of webbing of the toes is considerable, but, as suggested by Stejneger, is probably seasonal.

Type-locality. Port Desire, Patagonia.

Range *. Territories of Rio Negro, Chubut and Sta. Cruz, Argentina, and S. Chile (Punta Arenas).

4. *Pleurodema cinerea*, Cope.

Pleurodema cinereum, Cope, Proc. Am. Phil. Soc. xvii. 1877, p. 40; Nieden, Das Tierreich, Anura i. p. 498 (1923).
Paludicola cinerea, Boulenger, Cat. Batr. Sal. B.M. ed. 2, p. 232 (1882); Fernandez, An. Soc. Cient. Argentina, xci. 1921, p. 119, pl. i. fig. 5, pl. ii. fig. 8, pl. iii. figs. 21 & 25.
Paludicola borelli, Peracca, Boll. Mus. Torino, x. 195, 1895, p. 26; Berg, An. Mus Nac. Buenos Aires, v. 1896, p. 172; Peracca, *op. cit.* xii. 274, 1897, p. 17.
Pleurodema borelli, Nieden, *tom. cit.* p. 497.
Paludicola alpina, Andersson, Ark. Zool. iii. 1906, No. 12, p. 6, pl. i. figs. 1 & 1 *a*; Nieden, *loc. cit.*
? *Paludicola kriegi*, L. Müller, Zool. Anz. lxv. 1926, p. 194.

The specimens referred to the four species above mentioned must, apparently, be regarded as belonging to a single species, rather variable perhaps, but nevertheless distinct, which occurs in the Andes of N. Argentina, Bolivia, and S. Peru. The differences stressed by Anderson as distinguishing *P. alpina* from *P. cinerea* disappear when a large series of specimens is examined. The tongue is notched behind; vomerine teeth often rather indistinct; snout rounded as long as, or slightly longer than, the orbit, the nostrils being nearer the end of the snout than the eye; interorbital space slightly narrower than the upper eyelid; tympanum moderately distinct, one-half to one-third the diameter of the eye; fingers moderate, the first longer than the second; toes with a rudiment of web and slight dermal fringes in the male; metatarsal tubercles moderately prominent, subequal; tibio-tarsal articulation of the adpressed hind limb reaching to between the anterior border of the tympanum and the anterior border of the eye. Skin with numerous small warts or rarely quite smooth above; smooth below. A distinct oval lumbar gland.

Colour in spirit. Greyish or brownish above with darker spots or marblings which may be quite indistinct; a dark canthal streak and a bar below the eye are constantly present; sometimes a W-shaped marking is distinguishable on the anterior part of the back; occasionally a fine white line from snout to vent; inguinal gland with a large, irregular, black, white-bordered spot, which may be broken up.

---

* The localities of the specimens mentioned by Koslowsky are neglected, as uncertain.

Limbs irregularly cross-barred. Lower surfaces uniform white, the throat of the male infuscate.

Type-locality. Juliaca, Peru.

Range. Andes of Argentina, Bolivia, and S.E. Peru, up to 13,500 feet.

5. *Pleurodema bibroni*, Tschudi.

Bufo thaul (non J. G. Schneider), Lesson, Voy. 'Coquille,' Zool. ii. 1, p. 64, pl. vii. fig. 6 (1830).
Pleuroderma bibroni (err. typ.), Tschudi, Classif. Batr. in Mem. Soc. Sc. Nat. Neuch. ii. p. 85 (1838).
Pleurodema bibroni, var. A (part.) and var. C, Gunther, Cat. Batr. Sal. Brit. Mus. p. 38 (1858).
Pleurodema bibroni, Girard, U.S. Explor. Exp., Herpet. p. 38, pl. iv. figs. 33–38 (1858); Steindachner, Reise Novara, Zool. i., Amph. p. 13 (1867); Espada, Vert. Viaje, Pacif. Batr. p. 87 (1875); Philippi, Sup. Batr. Chile, p. 131, 1902; Méhely, An. Mus. Nat. Hung. ii. 1904, p. 213; Nieden, Das Tierreich, Anura i. p. 494, figs. 337–339 (1923).
Cystignathus bibroni, Dum. & Bibr. Erpét. viii. p. 410, pl. lxxxvii. fig. 2 (1841); Guichenot in Gay, Chile Rept. p. 96, pl. vii. fig. 1 (1848).
Pleurodema elegans, Bell, Zool. 'Beagle,' Rept. p. 37, pl. xvii. fig. 4 (1843); Girard, *op. cit.* p. 40, pl. iv. figs. 28-32 (1858).
Cystignathus elegans, Guichenot, *op. cit.* p. 101.
Paludicola bibroni, Boulenger, Cat. Batr. Sal. Brit. Mus. ed. 2, p. 231, fig. (1882) (in part.); Boettger, Kat. Batr. Mus. Senck. p. 30 (1892) (in part.); Werner, Verh. zool.-bot. Ges. Wien, xlvi. 1896, p. 358; Berg, An. Mus. Nac. Buenos Aires, v. 1890, p. 170; Werner, Zool. Jahrb. 1897, Supp. 4, p. 266.
? *Paludicola frenata*, Cope, Proc. U.S. Nat. Mus. xii. 1890, p. 143.
Pleurodema frenata, Nieden, *op. cit.* p. 495.
Pleurodema bibroni, var. *gracilis*, Philippi, *op. cit.* p. 132.
? *Pleurodema belli*, Philippi, *op. cit.* p. 124.
? *Pleurodema andina*, Philippi, *op. cit.* p. 127.
? *Pleurodema fusca*, Philippi, *op. cit.* p. 129.
? *Pleurodema glandulosa*, Philippi. *op. cit.* p. 134.
? *Pleurodema andicola*, Philippi, *op. cit.* p. 135.
? *Pleurodema plebeya*, Philippi, *op. cit.* p. 136.
? *Pleurodema longipes*, Philippi, *op. cit.* p. 137.
? *Pleurodema verrucosa*, Philippi, *op. cit.* p. 143.

The very large series of specimens examined shows that the species is subject to considerable variation, particularly in size, colour, and leg-length. Many of the species described by Philippi which are doubtfully included in the synonymy of this species are said to differ from the normal form in these particulars; they probably do not represent distinct subspecies. The largest specimen examined (♀) measured 52 mm. from snout to vent; Philippi's *P. belli* is said to have measured 66 mm. Breeding females from Coquimbo (possibly the same as Philippi's *P. plebeya*, which measured 35 mm.) measure only 34 mm. The tibio-tarsal articulation of the adpressed hind limb reaches to between the tympanic region and the anterior border of the eye. The colour-pattern consists primitively of three series of dark, irregular, white-bordered spots on each side of the body; by reduction or increase of the size of these spots the colour may become almost uniformly light grey or almost entirely black; the spots may also fuse longitudinally or transversely, the latter but rarely, except the pair of spots between the eyes, which frequently fuse to form a single triangular interorbital marking The anterior spot of the middle series, which extends from the eye to the angle of the mouth, is usually more distinctly white-margined than the others, and the lower white border is almost always present and distinct whether the dark spot is well developed or not.

Paludicola frenata of Cope is probably an aberrant specimen of this species. The complete "absence of webbing and dermal fringes on the toes" may be ascribed to the personal opinion of the describer, as, in a series, this character is very variable. As in *P. bufonina* the degree of development is probably seasonal; certainly it appears to be most strongly developed in breeding males. That the reduced second finger of *P. frenata* is probably abnormal is a view which is supported by the fact that the first is also reduced, but on one hand only.

The tadpole of this species does not appear to have been described previously. The following description is drawn up from a specimen with well-developed hind-limbs which forms part of a developmental series from Chillan collected by the late M. Lataste.

Length of body almost twice its breadth and about $\frac{2}{3}$ the length of the tail; latter $3\frac{1}{2}$ times as long as deep, ending in an obtuse point. Nostril nearer the eye than the tip of snout; distance between the eyes 3 times as great as the internarial distance and $1\frac{1}{3}$ times the diameter of the mouth; distance between the nostrils shorter than their distance from the eye or than the diameter of the latter; spiracle sinistral, directed upwards and backwards, nearer the eye than the hind limb; anus median; upper and lower caudal crests subequal, confined to the tail. Beak with black edges, the cutting-edges finely denticulate; lips papillose except the median half of the upper: tooth-rows $\frac{2}{3}$; upper [illegible] long, inner upper divided; outer lower $\frac{2}{3}$ width of [illegible] middle lower almost as long as the width of the [illegible] lower long, divided. Lines of mucous ducts [illegible] distinctly developed.

Colour in spirit. Grey above and on the sides with small darker spots. White beneath.

	mm.
Total length	47
Head length	18
Head width	10
Tail length	29
Tail depth	8

Type-locality. "South America (Monte Video)."

Range. Chile, W. of the Andes between about 30° and 44° S., extending over the Andes to the eastern slope in Argentina around Lake Nahuel Huapi (collected by Mr. F. W. Edwards, of the British Museum, in 1926).

6. *Pleurodema brachyops* (Cope).

Pleurodema bibroni, var. B, Günther, Cat. Batr. Sal. Brit. Mus. p. 32 (1858).

Pleurodema elegans (non Bell), Steindachner, Sitzb. Ak. Wien, xlviii. 1863, p. 186, pl. i. figs. 1–5; Reise Novara, Zool. i., Amph. p. 14 (1867).

Lystris brachyops, Cope, Proc. Ac. Philad. 1868, p. 312.

Pleurodema sachsi, Peters, Monatsber. Acad Berlin, 1877, p. 460.

Paludicola brachyops, Bouleng. Cat. Batr Sal. Brit. Mus. ii. p. 232, fig. (1882); Andersson, Ark. Zool. Stockholm, iii. 1906, No. 12, p. 8.

Pleurodema brachyops, Nieden, Das Tierreich, Anura i. p. 499 (1923); Ruthven, Misc. Pub. Mus. Zool. Michigan, viii. 1922, p. 53; Mir. Ribeiro, Arch. Mus. Nac. Rio Janeiro, xxvii, 1926, pp. 156 & 221.

Andersson (*loc. cit. supra*) has expressed doubt as to whether the species described by Cope is the same as that described under the various names quoted above by other authors. Cope's original description certainly is not entirely in agreement with any of the specimens examined, differing particularly in the statements that the toes are free and without dermal margins, and that the first finger is shorter than the second; many of the salient features of the species (the short hind limbs and digits, the large black-spotted inguinal gland, and the large metatarsal shovels) are mentioned, and, as no other species is known which combines vomerine teeth, inguinal glands, and shovel-shaped metatarsal tubercles, it is proposed to adopt the conservative policy of retaining Cope's name until it can be shown that his description is really applicable to a distinct species.

Type-locality. Magdalene River, Colombia.

Range. N.E. Colombia, Venezuela, Brazilian Guiana, and Aruba.

7. *Pleurodema diplolistris* (Peters).

Cystignathus diplolistris, Peters, Monatsber. Ak. Berlin, 1870, p. 648, pl. ii. figs. 2–2 *a*.
Paludicola diplolistris, Boulenger, Cat. Batr. Sal. Brit. Mus. ed. 2, p. 233 (1882); Baumann, Zool. Jahrb. Syst. xxxiii. 1912, pp. 129, 152, 162, Map vi. 4.
Pleurodema diplolistris, Nieden, Das Tierreich, Anura i. p. 500 (1923); Mir. Ribeiro, Arch. Mus. Nac. Rio Janeiro, xxvii. 1926, pp. 157 & 221, fig. 87.

Miranda Ribeiro has recently (*loc. cit. supra*) redescribed this species and figured the foot, hand, and shoulder-girdle. Comparison of this description with the type-specimen shows that the description is accurate for the most part. There is, however, no trace of the small tubercle in the middle of the tarsus which Miranda Ribeiro figures, and there are several inaccuracies in the figure of the shoulder-girdle; the clavicle is, of course, quite distinct from the pro- and epi-coracoid cartilages, there is no line of demarcation between these two cartilages, and the sternal style is ossified and quite distinct from the epi-coracoid.

Type-locality. Céara, N.E. Brazil.

Range. From Céara to San Salvador de Bahia, N.E. Brazil.

8. *Pleurodema darwinii*, Bell.

Pleurodema darwinii, Bell, Zool. 'Beagle,' Rept. p. 36, pl. xvii. fig. 3 (1843); Hensel, Arch. f. Naturg. 1867, p. 133; Nieden, Das Tierreich, Anura i. p. 496 (1923).
Pleurodema bibroni, var. A (part.), Gunther, Cat. Batr. Sal. Brit. Mus. p. 32 (1858).
? *Pleurodema bibroni*, Cope, Proc. Ac. Philad. 1862, p. 352.
Paludicola bibroni, Boulenger, Cat. Batr. Sal. Brit. Mus. ed. 2, p. 231 (1882) (in part.); O. Boettger, Kat. Batr. Mus. Senck. p. 30 (1892).
Paludicola darwinii, Berg, An. Mus. Nac. Buenos Aires, v. 1896, p. 171.

This species has constantly been spoken of as having vomerine teeth. Bell, in describing the species, says the teeth are "small and with difficulty distinguishable," and Günther, referring to the type-specimen, says "not being in a good state and having lost the vomerine teeth." Careful examination has failed to reveal any traces of vomerine teeth, not only in the type-specimen, but in three others also. It would appear, therefore, that vomerine teeth are normally absent in this species, but it may be readily distinguishable from *P. bibroni*, the species with which it has been confused, on other characters. Thus, the outer metatarsal tubercle is more strongly developed, being as large as the inner, the snout is vertically truncate anteriorly, the interorbital space is distinctly broader than the upper eye-lid, and there is a well-developed prominent gland at the angle of the mouth.

Type-locality. Maldonado.

Range. S. Uruguay.

9. *Pleurodema sagittifer* (Schmidt).

Leiuperus sagittifer, O. Schmidt, Sitzber. Ak. Wiss. Wien, xxiv. 1857, p. 10, and Denk. Ak. Wien, xiv. 1858, p. 240.
Paludicola sagittifera, Boulenger, Cat. Batr. Sal. Brit. Mus. ed. 2, p. 236 (1882).
Paludicola sagittifer, Nieden, Das Tierreich, Anura i. p. 512 (1923).

Known only from the type-specimen from Colombia.

10. *Pleurodema marmorata* (Dum. & Bibr.). (Fig. 3.)

Leiuperus marmoratus, Dum. & Bibr. Erpét. viii. p. 421 (1841); Tschudi, Faun. Per. Rept. p. 168 (1845); D'Orbigny, Voy. Amér. Mérid. v. 1, p. 10, pl. xv. figs. 1-4 (1847); Günther, Cat. Batr. Sal. Brit. Mus. pp. 22 & 135 (1858); Schmidt, Denk. Ak. Wien, xiv. 1858, p. 240, pl. iii. fig. 27.
Leiuperus viridis, Tschudi, *op. cit.* p. 69; Peters, Monatsber. Ak. Berlin, 1873, p. 623.
Paludicola marmorata, Boulenger, Cat. Batr. Sal. Brit. Mus. ed. 2, p. 235 (1882); Nieden, Das Tierreich, Anura i. p. 510 (1923).

This species does not differ appreciably from the descriptions of it already published. The tympanum is frequently rather indistinct and, rarely, traces of vomerine teeth may be present. An interesting osteological variant is found in the sternum of this species. Normally the osseous sternal style is quite simple, but in large females (at least) there is a decided though slight bifurcation posteriorly (fig. 3, *a*).

Type-locality. Potosi.

Range. Andes of S. Peru, Bolivia, and N. Argentina (Sta. Catalina).

11. *Pleurodema mexicana* (Brocchi).

Leiuperus mexicanus, Brocchi, Bul. Soc. Philom. ser. 7, i. 1877, p. 184; Miss. Sci. Mex. iii. 2, p. 21, pl. v. figs. 3, 3 *a*-3 *c* (1881).
Paludicola? *mexicana*, Boulenger, Cat. Batr. Sal. Brit. Mus. ed. 2, p. 237 (1882); Günther, Biol. Cent.-Amer., Rept. & Batr. p. 219 (1900).
Paludicola mexicana, Nieden, Das Tierreich, Anura i. p. 513 (1923).

No specimens of this species have been examined, but it has been referred to this genus rather than to *Physalæmus* on account of the absence of any tarsal tubercle; its real position is still uncertain.

Known only from the type-specimens from Mexico.

12. *Pleurodema verrucosa* (Reinhardt & Lütken).

Leiuperus verrucosus, Reinh. & Lutk. Vid. Meddel. Copenhagen, xiii. 1862, p. 171.

Paludicola verrucosa, Boulenger, Cat. Batr. Sal. Brit. Mus. ed. 2, p. 171 (1882); Baumann, Zool. Jahrb. Syst. xxxiii. 2, 1912, pp. 133, 151, 162, Map vi. 4; Nieden, Das Tierreich, Anura i. p. 507 (1923); Mir. Ribeiro, Arch. Mus. Nac. Rio Janeiro, xxvii. 1926, pp. 164, 223.

As no complete description of this species has appeared except the original one in Danish, it appears advisable to give one in English. The following description is drawn up from a translation of the original description:—

A single specimen of this smooth-palated Cystignathid was collected by Reinhardt near Juiz de Fora, Minas Geraes (in a region of virgin forests). The species is slender, the head broad, flattened, and obtuse; mouth large, canthus rostralis distinct, loreal region vertical, and the internarial distance greater than half the distance between eye and nostril. Tongue large, spatulate, narrower in front, free and entire behind; tympanum almost invisible. Fore limbs slender; fingers and toes slender, slightly dilated at the tips, but in general shape Cystignathiform and without any trace of webbing or dermal fringes; third finger considerably longer than the others, which are subequal. In addition to the large subarticular tubercles on the fingers and the tubercles on the wrist there are several prominent, almost contiguous, tubercles along the metacarpals, two prominent metatarsal tubercles and numerous small warts on the underside of the metatarsus; third and fifth toes subequal and reaching the terminal joint of the fourth; subarticular tubercles of toes well developed and prominent. Upper surface and sides coarsely granular, covered with pointed warts; beneath finely granular except a few patches—viz., a small patch on the breast, the thigh, a portion of the anterior side of the tarsus, and the upper part of the feet, which are almost smooth.

Colour, ash-grey stippled with black and with fine black vermiculations, especially on the upper lip and the limbs; lower surfaces pale.

	mm.
Body and head	22
Legs................................	39
Foot	18

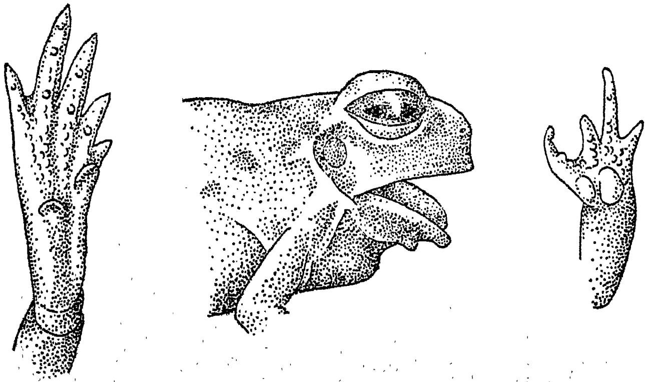
Known only from the type-specimen.

13. *Pleurodema nebulosa* (Burmeister). (Fig. 5.)

Leiuperus nebulosus, Burmeister, Reise La Plata, ii. p. 532 (1861).
Paludicola nebulosa, Boulenger, Ann. & Mag. Nat. Hist. (5) xx. 1887, p. 295; Berg, An. Mus. Nac. Buenos Aires, v. 1896, p. 179; Nieden, Das Tierreich, Anura i. p. 509 (1923).

This well-defined species differs from all the other members of this genus in having the sternal style distinctly forked; only in *P. marmorata* (see above) is this condition approached. It is referred to this genus, however, since in general habitus, lack of a quadrato-jugal, and its broadly fringed toes it agrees with other species of *Pleurodema* and differs from all those of *Physalæmus*.

Fig. 5.



Foot, head, and hand of *Pleurodema nebulosa* (Burmeister).

Known only from the type-locality, Mendoza, Argentina.

The following species described by Philippi must, apparently, be referred to this genus, but are not sufficiently well described for them to be included in the key.

? 14. *Pleurodema pseudophryne*, Philippi.

Pleurodema pseudophryne, Phil. Sup. Batr. Chil. p. 126 (1902); Nieden, Das Tierreich, Anura i. p. 501 (1923).

Eyes much approximated, only 1 mm. apart; upper surface warty; lumbar glands semiglobose; palmar, tarsal, and subarticular tubercles but slightly prominent. Length 54 mm.

Chonos Archipelago.

? 15. *Pleurodema carbonaria*, Philippi.

Pleurodema carbonaria, Phil. *op. cit.* p. 138; Nieden, *loc. cit.*

Skin smooth; third finger with a truncate dilatation distally as in *Hylodes*; other digits not dilated; subarticular and palmar tubercles well marked. Length 37 mm.

Valdivia, Chile.

? 16. *Pleurodema aspera*, Philippi.

Pleurodema aspera, Phil. *op. cit.* p. 139; Nieden, *loc. cit.*

Skin above and below rough but without glandular prominences. Head narrow, fingers short, the 3rd and 4th with a rudiment of web. Lumbar gland present, small. Length 32 mm.

Aconcagua, Chile.

? 17. *Pleurodema phryniscoides*, Philippi.

Pleurodema phryniscoides, Phil. *op. cit.* p. 140; Nieden, *loc. cit.*

Eyelids prominent in the middle; tympanum covered with skin; upper parts smooth or with hard ridges. Lumbar gland present. Uniform dark grey or black above, white beneath. Length 30 mm.

? 18. *Pleurodema montevidense*, Philippi.

Pleurodema montevidense, Phil. *op. cit.* p. 142.
Pleurodema montevidensis, Nieden, *op. cit.* p. 500.

Tympanum little distinct; vomerine teeth present; lumbar gland small. Length 29 mm.

Montevideo.

LXI.—*The Cæcilian Genera* Uræotyphlus *and* Geotrypetes.

By H. W. Parker, B.A.

A careful comparison of the type-specimen of *Geotrypetes petersii*, Boulenger, with a co-type of *Cæcilia seraphini*, A. Duméril, shows that, despite statements to the contrary *, these two names are synonyms. The two species were said to differ in various characters (size of teeth, number of teeth in the inner row of the mandible, length of the snout, degree of elongation of the body, and the number of body-folds), but the following comparison will show that the alleged differences are not tenable:—

---

* Boulenger, Ann. & Mag. Nat. Hist. (6) xv. p. 328 (1895).

	Geotrypetes petersii, Boul. Type. Length 195 mm.	*Cæcilia seraphini*, Dum. Co-type. Length 233 mm.	*Uræotyphlus africanus*, Boul. Type. Length 165 mm. (=*seraphini*, Dum.).
Length of sixth mandibular tooth........	0·61 mm.	0·45 mm.	0·57 mm.
Teeth in inner row of mandible	14	12	13
Ratio of length to diameter of body	32·5	29·1	27·5
(In the adult co-type of *C. seraphini* described by A. Duméril this ratio is 35·0.)			
No. of body-folds:			
Primary...........	93	92	89
Secondary	42	39	42
Complete primary ..	8	6	8
Complete secondary..	7	5	7
Caudal annuli	2	2	2

The distance between the end of the snout and the eye, as compared with the interocular distance, is variable; in a series of three specimens from one locality (Obuasi, Ashanti) the interocular distance is distinctly less than the length of the snout in half-grown individuals, but as long as the snout in the adult. Accordingly, the three species must be regarded as conspecific, and *seraphini*, as the oldest name, takes precedence.

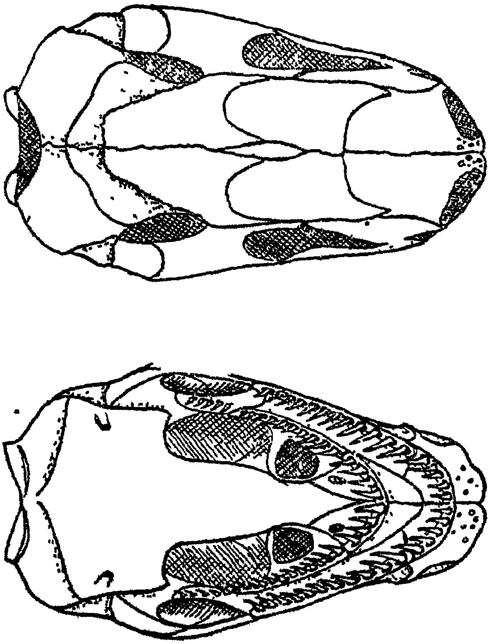
As, however, *seraphini*, Duméril, has usually been referred to the genus *Uræotyphlus*, and *petersii*, Boulenger, to *Geotrypetes*, the question arises as to whether these two genera are distinct. Comparison of a skull of *seraphini* with skulls of *Uræotyphlus oxyurus* and *U. malabaricus* shows that the West-African species is generically distinct and the genus *Geotrypetes* must be retained; *Uræotyphlus*, freed from its West-African species, retains only Oriental species, and another distributional anomaly is removed.

The two genera may be distinguished as follows:—

I. A prefrontal and a postfrontal distinct; orbit not prolonged anteriorly; no fronto-parietal foramen; posterior nares between the vomer and the palatine.................................. *Uræotyphlus*.

II. No pre- or postfrontal; orbit prolonged anteriorly, almost in contact with the tentacular groove; a fronto-parietal foramen, allowing the ossified orbito-ethmoidal region to show through as a median unpaired bone in the cranial roof; vomer excluded from the posterior nares, which lie entirely in the palatine .... *Geotrypetes* (fig.).

The chief character in which these two genera resemble each other—*i. e.*, the presence of a foramen between the parietals and the quadrato-jugal arch—is probably primitive



Skull of *Geotrypetes seraphini* (A. Duméril).

and has persisted elsewhere (e. g., *Rhinatrema*, *Chthonerpeton*, and *Bdellophis*). It seems probable that *Uræotyphlus* is more closely allied to some such genus as *Ichthyophis*, with which it agrees closely in the general configuration of the skull, and in which both pre- and postfrontal bones are distinct, than to *Geotrypetes*; the affinities of the latter genus may prove to be rather with *Hypogeophis*.

LXII.—Podisma kingdoni, *sp. n.* (*Orthoptera*, Acrididæ): *a Contribution to the Zoogeography of the Himalayas.* By B. P. Uvarov.

Mr. F. Kingdon Ward, the well-known botanist and explorer of some most difficult to access regions of the Upper Burma, Assam, and Tibet, was kind enough, on his recent voyage to the farthest Assam, to collect some Orthoptera at my special request, the fauna of those regions being practically unknown. The collection he brought home, though not very large and made mainly in the relatively low-lying regions, not in the most interesting Alpine zone, includes, nevertheless, several new species, while all records of previously known species are very valuable for the study of their distribution. While a complete use of the material will be made elsewhere, I find one new species particularly interesting and deserving immediate attention.

This is a wingless grasshopper of the large genus *Podisma*, Latr., which ranges over Eastern Asia, down to Japan and Formosa; in Europe there is a considerable number of species, but mainly in the mountains, while at least one species is known from North America, where a very closely allied genus *Melanoplus* is very extensively developed. Distribution of species of the genus *Podisma* in the mountainous regions of Central Asia is very peculiar. In the Russian Central Asia the genus occurs only in the Altai, and is replaced farther south-westwards by the exceedingly similar in appearance, but totally unrelated, genus *Conophyma*, Zub. Members of the latter replace *Podisma*, apparently, in the whole Pamir and Hindukush systems, and one species is known also from Kashmir; but there was no evidence until now which of the two genera is represented in the Eastern Himalayas. Mr. Kingdon Ward's discovery in Assam proves that it is *Podisma*, and this tends to show, in my opinion, that the past history of the fauna of the Assam Himalayas must be very different from that of the Western Himalayas and of other Central-Asian mountain-systems as well. Present distribution of members of the genus *Podisma* indicates that it must belong to the fauna which originated on the ancient Angara continent of geologists, and spread from there north-westwards through Siberia into Western Europe and into North America. Migration of the Angara fauna into Europe was connected with the Glacial Period, and many of its members were stranded there on mountains after the climate had changed again. It is not clear what prevented the Angara fauna penetrating into the Central

Asian mountains, but the fact remains that their Alpine fauna of Orthoptera is composed of entirely different elements. It is true that certain members of the Angara fauna occur in Tibet, even to its western limits (for instance, genus *Bryodema*), but these are good fliers, and their appearance there may be explained by a relatively recent migration; the bulk of the Central Asian Alpine Orthoptera show a definite relationship not to the Angara (or to the Palæarctic generally) fauna, but, surprisingly enough, to the tropical Indian forms. It is particularly well emphasized by the presence amongst them of wingless members of the subfamily Eumastacinæ—a typically tropical group. The explanation for the appearance of these tropical elements in the highest mountains of Central Asia, where the climatic conditions are exceedingly severe, cannot be satisfactorily explained by their spontaneous migration from the lower zones upwards. I am convinced, therefore, that the tropical element in the Alpine fauna of Central Asia is due to the fact that most of the Central Asian ranges are geologically relatively young, and, when they were formed, the original tropical fauna of the country was lifted with them. This amounted to an exposition of the tropical faunistic elements to utterly different climatic conditions, and it is not surprising that only few of them survived, though considerably modified in structure. In this way the Central Asian Alpine Eumastacinæ (genera *Gomphomastax*, Br. W., and *Pædomastax*, C. Bol.), all entirely apterous, originated from their tropical, mostly fully winged, relatives, and the same may be said with regard to *Conophyma* (and the Himalayan *Dicranophyma*, Uv.), which is related to certain Indian genera, but has no trace of elytra or wings.

The above considerations show that the discovery of a member of the genus *Podisma* in the Assam Himalayas is a fact of considerable zoogeographical importance, since the insect is apterous and cannot possibly be regarded as a recent immigrant from the East. Its presence there shows that the mountain fauna of that region must form an outpost of the Angara fauna, which, by the way, is very typically developed in the Alpine zone of Yunnan *. The new *Podisma*, which I am very pleased to dedicate to its discoverer, marks off the most western known point of the occurrence of the original Angara elements in the Himalayas.

---

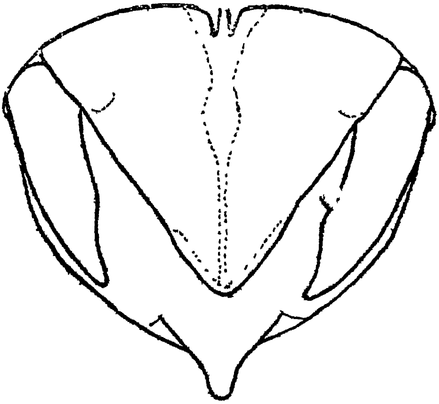
* See my paper on Orthoptera collected by Prof. Gregory's Expedition to Yunnan (Journ. & Proc. Asiat. Soc. Bengal, new series, xx. 1925, pp. 313-335). Some general considerations on the Alpine fauna of Orthoptera of Himalayas are given in my report on the Orthoptera in 'Mission dans les Provinces Centrales de l'Inde et dans la région occidentale de l'Himalaya par Guy Babault' (Paris, 1925).

Podisma kingdoni, sp. n.

♂ (*type*). Somewhat more robust than *P. pedestris*, L., resembling it in the coloration of the hind legs, but not closely related to it.

Frontal ridge slightly oblique in profile, distinctly sulcate throughout, very feebly expanded above the ocellum, gradually narrowed to the fastigium; margins well raised, sharp, continuous with the margins of the fastigium. Fastigium strongly sloping, sulcate, with sharp raised margins; it is very little widened forward, the widest part being scarcely wider than the frontal ridge above the ocellum. Eyes large, strongly prominent; the subocular distance is considerably less than the horizontal diameter of an eye.

Pronotum cylindrical, not at all flattened above, rugose all over. Anterior margin very broadly rounded, with a slight notch in the middle, distinctly reflexed; posterior margin practically straight, with a scarcely perceptible median emargination. Transverse sulci deep and broad; metazona less than half the length of prozona. Lateral lobes a little longer than high, between the sulci shining, though punctured, elsewhere rugose; lower margin rounded-prominent. Median keel scarcely perceptible, irregular. A narrow portion of mesonotum is visible, not covered by the pronotum. Metanotum and first abdominal tergites rugose, with a feeble median keel. Prosternal tubercle conical, short, not projecting beyond the level of mesosternum. Mesosternal inter-



Podisma kingdoni, sp. n., ♂. End of abdome space somewhat narrower than one of the lobes. Metasternal interspace elongate, narrow.

Tympanal organ small and, apparently, not functioning.

Elytra quite rudimentary, minute, scale-like.

Last abdominal tergite with a pair of narrow teeth in the middle. Supra-anal plate triangular, with the apex rounded; a shallow sulcus runs along the middle, widening basally; lateral margins incrassate near the apex and not far from the base, where sublateral tubercles are formed. Cerci as long as the supra-anal plate, stout, laterally compressed, with the inside slightly concave; apex broadly obliquely truncate. Subgenital plate small, with the apex attenuate and rounded-truncate.

General coloration dull brownish olivaceous. Transverse sulci of the pronotum on the lateral lobes partly black. Pleuræ with indefinite black streaks. Hind femur above and inwardly brownish red, with two not sharply defined blackish fasciæ, which fade both on the outer and on the inner surface; lower surface red; knee black, except the apical part of the outer lobe, which is pale yellowish; a pale yellow ring at the base of the knee contrasts strongly with the black knee. Tibia dirty greenish blue, with a pale yellowish subbasal ring; spines wholly black.

♀ (*paratype*). More robust and less rugose than the male. Frontal ridge around the ocellum and below it impressed, elsewhere flat, strongly punctured, distinctly expanded above the level of antennæ. Fastigium of vertex broader than in the male, shallowly impressed, with the margins little raised and obtuse. Pronotum distinctly widened in metazona, conical. Metanotum only punctured, not rugulose; tergites smooth. Upper valve of the ovipositor short, stout, recurved; lower valvæ moderately slender, with an obtuse tooth.

Length of body, ♂ 19, ♀ 28 mm; pronotum, ♂ 5, ♀ 6·5; elytra, ♂ ♀, 0·5; hind femur, ♂ 12, ♀ 14·5.

Described from two males and three females taken in a pine-forest at Zayul River, Kahao, Assam, alt. 4000 ft., 18. vii. 1926 (*F. Kingdon Ward*).

The new species is remarkable for its rough sculpture, particularly in the male sex, by its round pronotum, narrow fastigium of vertex, very minute scale-like elytra, reduced tympanum, and the coloration of the hind legs. Of all members of the group Melanopli known to me, *P. kingdoni* resembles the American genus *Bradynotus* most, but there is no reason to suggest a relationship, the likeness being due, probably, to the similarity of environmental conditions.

BIBLIOGRAPHICAL NOTICES.

C. Tate Regan. *The Pediculate Fishes of the Suborder Ceratioidea. The Danish 'Dana' Expeditions*, 1920–22, *in the North Atlantic and the Gulf of Panama. Oceanographical Reports.*—No. 2. Copenhagen and London, 1926. 4to. 45 pp., 13 pls., text-figs. Price 15*s*.

One of the most striking of recent discoveries in pure zoology was made by the present Director of the Natural History Museum, when he showed that the "young" which Sæmundsson found attached to the deep-sea angler-fish *Ceratias holboelli* were really dwarf males parasitic on the female. He now gives a monograph of the suborder Ceratioidea based upon the collections made by Dr. Johannes Schmidt in the course of the 'Dana' Expeditions in 1920–22. Prior to these expeditions Regan estimates that some sixty specimens of these fishes had been recorded. The 'Dana' collected no fewer than two hundred and twenty, excluding larval and postlarval examples. From this magnificent material Regan describes twenty-six new species, including the types of nine new genera. The forms of the females are very varied, and many are incredibly fantastic. Dwarf males have been found in three genera belonging to very distinct families, and Regan believes that they will be found to be universal within the suborder, although only four individuals with males attached have as yet been recorded. Attention may be directed to Regan's remarks on the bearing of the facts described on current evolutionary theories.

An Introduction to Experimental Embryology. By G. R. de Beer. Oxford: Clarendon Press, 1926. 8vo. 148 pp., 51 text-figs.

Every biologist is aware that the science of experimental embryology, which the Germans call "Entwicklungsmechanik," has made very great advances in recent years, but, except for specialists, it has been difficult to keep up with the development of the subject. The only general account in English has hitherto been Jenkinson's 'Lectures on Experimental Embryology,' published twenty years ago. Mr. de Beer has therefore done good serviee by writing this little volume, in which he gives an elementary survey of the whole field, and attempts to knit together into a more or less ordered system of knowledge the loose ends of fact that have been accumulated. The progress that has been made towards an analysis of the phenomena of fertilization, the external and internal factors of development, the conditions of differentiation and the like, are clearly set forth, and, although not a few loose ends are still to be found, the main outlines of the picture are beginning to stand out. The book will serve excellently to give students an introduction to the study of the original papers, of which a selected list is given. Mistakes in grammar and other evidences of hasty writing are unpleasantly frequent. Even a scientific work is none the worse for a little attention to the elements of composition.

PROCEEDINGS OF LEARNED SOCIETIES.

GEOLOGICAL SOCIETY.

April 27th, 1927.—Dr. F. A. Bather, M.A., F.R.S., President, in the Chair.

The following communication was read:—

'The Conglomerates of the Enville Series of the Warwickshire Coalfield.' By Frederick William Shotton.

The conglomerates are found at three horizons, to which, in descending order, the names of Allesley, Corley, and Arley-Exhall have previously been applied. Results of interest have been obtained only from the two lowest conglomerates.

The derived pebbles consist chiefly of dark Valentian sandstone, Carboniferous Limestone, and Carboniferous chert, with less important quartzite, vein-quartz, and coarse felspathic grit. Igneous material is extremely rare. The Arley-Exhall pebbles are mainly Carboniferous cherts, with less abundant limestone and Valentian sandstone; while the Corley materials are predominantly Valentian, with some chert, but limestone is very rare among them.

From the sandstone-pebbles a fauna of Upper Valentian age has been obtained. This is especially characterized by the great abundance of *Cœlospira hemispherica* and several species of *Camarotœchia*, and by the complete absence of *Pentamerus*, *Stricklandinia*, *Plectambonites*, and *Spirifer*.

The cherts have yielded a small fauna of Lower Carboniferous age.

A consideration of the relative abundance of the various types of pebbles at all the examined outcrops leads to the conclusion that the Valentian pebbles of the Arley-Exhall conglomerate were probably derived from the west, whereas there is good evidence that similar material at the Corley horizon came from the east. It seems most reasonable to suppose the previous existence of Upper Valentian deposits upon the present north-to-south underground extension of the Nuneaton ridge. Such a deposit would be 25 miles beyond the easternmost exposure of similar rocks in the Midlands (Rubery, near the Lickey Hills), and would almost certainly be deposited close to the Valentian shore-line. This position might explain the restricted fauna.

Evidence for the sources of derivation of the other types of pebbles is inconclusive, although there is some reason to believe that the limestone-pebbles of the Corley conglomerate came from the west or from the south-west.

May 11th, 1927.—Dr. F. A. Bather, M.A., F.R.S., President, in the Chair.

The following communications were read:—

1. 'The Salopian Rocks and Tectonics of the District South-West of Ruthin (Denbighshire).' By Prof. Percy George Hamnall Boswell, D.Sc., F.G.S.

The district described extends southwards and south-westwards from Ruthin, and is bounded on the south by the northernmost fault (or Braich Fault) of the Llanelidan system of east-and-west fractures. It is composed of Salopian beds folded gently on axes running east-north-east and west-south-west, the sequence being as follows: Denbigh Grits, Zone of *Cyrtograptus rigidus (?)*, *Monograptus-flemingi* beds, zones of *M. nilssoni*, *M. scanicus*, *M. tumescens*, and *M. leintwardinensis*. In the lowest *nilssoni* beds, *M. vulgaris* is found rarely in association with graptolites characteristic of the *nilssoni* zone. The lithology is somewhat monotonous, varying from slablike, ribbon-banded flags in the *flemingi* beds and in the lower part of the zone of *M. nilssoni*, to thinly bedded and calcareous flags in the upper part of that zone and also in the zone of *M. scanicus*. Gritty tough mudstones and sandstones are found in the uppermost zones.

Graptolites are plentiful in all but the *tumescens* beds, where they are rare.

The *nilssoni* beds occupy the greater part of the western half of the area, which may therefore be regarded as anticlinal; the zone of *Monograptus leintwardinensis* forms most of the eastern half, which thus expresses a synclinal tendency.

The dominant faulting is north-eastward in trend. Like the folding and cleavage (which is generally parallel to the fold-axes, with a steep northward dip), it is regarded as Caledonian. North-and-south faulting, which borders the Vale of Clwyd in the north-eastern part of the area, is of post-Carboniferous age. Similarly, the east-and-west Braich Fault limits the fault-system of north-eastern trend on the south, and is also post-Carboniferous. Where the north-east and south-west fault-system meets the north-and-south fractures and the Braich Fault, the beds are much shattered.

Reasons are given for regarding the Braich Fault (which separates heavily-cleaved and sharply-folded rocks on the south from gently-dipping and slightly-cleaved rocks on the north), as an old fracture, throwing to the north in post-Silurian times, along which tearing movement (westwards on the northern flank) took place at a post-Carboniferous date.

2. 'The Geology of the Country between Llanelidan and Bryneglwys (Denbighshire).' By Robert Churchill Blackie, M.Sc.

The Llanelidan district consists largely of Lower Ludlow deposits, which have hitherto been undifferentiated. Wenlock beds are restricted to the area west and north-west of Gwyddelwern, but there is also a small inlier in the centre of the Llanelidan anticlinorium, less than a mile south of the village. The Wenlock Series comprises the Denbighshire Grit, the upper limit of which is approximately the summit of the zone of *Cyrtograptus rigidus*; also a series of slablike beds, representing the zone of *C. lundgreni*.

The chief zones of the Lower Ludlow are represented, that of *Monograptus nilssoni* occupying the largest area. The lithology varies within narrow limits from base to top. The zone of *M. nilssoni* is represented by flags, consisting of alternating bands of muddy and silty material. From the uppermost beds of the zone, the lithology becomes increasingly more arenaceous up to the zone of *M. leintwardinensis*, which is succeeded unconformably by the Carboniferous Limestone. Beds yielding *M. vulgaris* have been noted at the base of the *M.-nilssoni* Zone.

The region came under the influence of the Caledonian movements, which resulted in folding, cleavage, and dominant south-west and north-east faulting. The Llanelidan and Bryneglwys Faults date also from this time. Folding and cleavage are approximately parallel along east-and-west lines, the cleavage dipping consistently northwards at varying angles. As postulated by Dr. L. J. Wills & Dr. Bernard Smith, this is believed to indicate deep-seated forces operating from the south. The Ludlow rocks were ridged up into an anticlinorium trending east and west from Ffynnon-Tudur to Craig-lelo (south of Derwen), with complementary synclinoria around Nantclwyd and in the Bryneglwys valley, on the north and on the south respectively.

In post-Carboniferous times further movements of a torsional character affected the region, and movement was renewed along the master-faults, together with the initiation of smaller adjustment-dislocations between the Llanelidan and Bryneglwys Faults. Along these fractures tear-faulting was prevalent, the movement being eastwards or north-eastwards on the southern sides of the fractures.

It is with great regret that we have to announce to our readers the deaths of Sir Arthur Shipley and Mr. G. C. Champion, who have been connected with the 'Annals' for many years. It is not proposed to issue obituary notices, as these will be found in the Scientific Journals with which they were more intimately connected.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[NINTH SERIES.]

No. 119. NOVEMBER 1927.

LXIII.—*On some new and little-known Orthoptera from Palæarctic Asia.* By S. P. Tarbinsky.

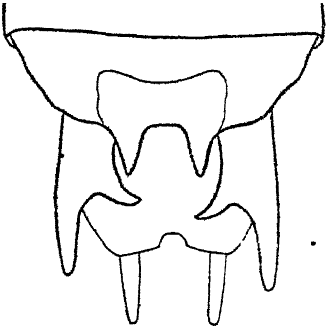
Family Tettigoniidæ.

Metrioptera engelhardti, Uv. (Fig. 1.)

♂. Pronotum covers the head to the eyes. Disc of the pronotum narrowed anteriorly, distinctly impressed in its whole length; its hind margin rounded. Lateral keels of pronotum rounded; median keel distinct in metazona; lateral lobes as long as wide, forming with the disc a distinct angle, with straight, strongly oblique hind margin and with the lower margin almost perpendicular to it and slightly rounded; the hind lower angle of the lateral lobes broadly rounded. Elytra and wings well developed, extending beyond the hind knees. Middle femora basally with transverse rugosities; hind femora long, slender, very suddenly attenuate behind the middle, on the outside with transverse regular rugosities throughout. The last tergite short, transverse, with two narrow triangular lobes, which are slightly curved up, and with a rather deep rounded emargination between them; last tergite sloping backwards, in the middle irregularly impressed. Cerci in the basal portion thick, extending a little beyond the subgenital plate with a strong, slightly turned downward tooth in the middle. Subgenital plate elongate, with two thick lateral keels and with a feeble thin median keel ; its hind margin straight, in the middle slightly excised. Styli short.

General coloration light castaneous. Head yellowish brown, beyond the antennæ with a large shining castaneous stripe, extending on to the lateral lobes of the pronotum. Margins of lateral lobes of the pronotum dirty yellow. Elytra infumate with indistinct castaneous spots. Front femora with sparse small black spots ; middle femora on the outside with large black spots basally and small spots apically. Hind femora basally above dark, externally with a black broad longitudinal stripe attenuate towards the apex. Abdomen castaneous above, yellow below. Subgenital plate with dark lateral lobes. Teeth of cerci black.

Fig. 1.



Metrioptera engelhardti, Uv., ♂.

	mm.
Length of body	15
„ pronotum	4·8
„ elytra............	21·8
„ hind femora	17·3

One male taken at the River Amasar, Transbaicalia, 20. vii. 1909.

This species was recently described by Mr. B. P. Uvarov [*] after a single female from the Russian Far East without indication of the exact locality. In the collections of the Zoological Museum of the Moscow University I found one male of *Metrioptera*, which differs well from all other known species of this genus, and which I decided to describe as a new species. But not long ago I had the possibility of studying the type of *M. engelhardti*, sent by the author to the Museum (it bears a label "Russian Island"), and I came to the conclusion that the male specimen from Amasar, fully agreeing in its habitus and coloration with the female type, represents the hitherto undescribed male of *M. engelhardti*, Uv.

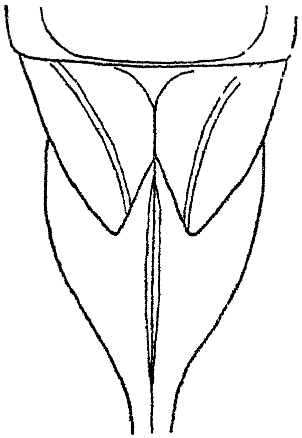
---

[*] Ann. & Mag. Nat. Hist. ser. 9, xvii. pp. 273–291 (1926).

Metrioptera ussuriana, Uv. (Fig. 2.)

River Daubiche, west from the Lake Chanka in the southern part of Primorskaja prov. (the label reads 44° 30′ N., 133° E., Greenwich) (*N. Ikonnikov* leg.).

Fig. 2.



Metrioptera ussuriana, Uv., ♀.

Among the collections of the Zoological Museum of Moscow I found also a series of male and female specimens of the species described by Uvarov (*l. c.*) after a single male from the district Spassky, Primorskaja prov. The description given by Uvarov for his species agrees with the ♂ ♂, which have been collected by Mr. N. Ikonnikov. The difference is only in the following character:—Elytra in the male before me are not widened towards the apex, but are equally broad along their total length, with the fore outer angle broadly rounded. It is to be presumed that the words "Elytra widened towards the apex" in the description by Uvarov refer to folded elytra, but not when they are spread out.

Below I give a short description of the hitherto-unknown female, which is very like the male.

♀. Pronotum rounded, slightly impressed above in the middle. Elytra with the hind and fore margins parallel, rather short, extending only a little beyond the end of the third tergite, rounded apically. The last tergite transverse, above with a longitudinal impression, which is triangular in cross-section ; its hind margin not deeply excised, with two short triangular lobes. Subgenital plate triangular with a thin median keel and with two thick rounded lateral keels diverging towards the base. Lateral lobes of the subgenital plate almost vertical, impressed, with the side-margins turned down. The apex of subgenital plate deeply triangularly excised. Ovipositor rather short, curved in its total length. Coloration as in the ♂, but with the pale parts darkened.

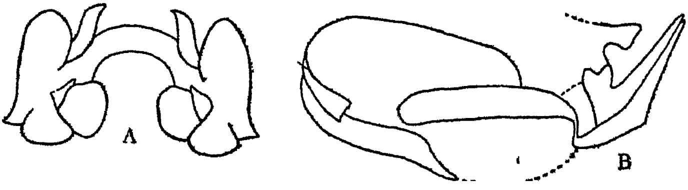
	mm.
Length of body	20·6
„ pronotum	5·4
„ elytra	7·5
„ hind femora	18·5
„ ovipositor	8

Family Acrididæ.

Stauroderus intermedius, Bej-B. (Fig. 3.)

N. Mongolia : Riv. Mansa and Sharotai, Kentei, 19. vii. 1897 ; riv. Zachora, Kentei, 20. vii. 1897 (*Klemenz*).

Fig. 3.



Stauroderus intermedius, Bej-B., ♂, internal genitalia.

This species has been described recently by Mr. G. J. Bej-Bienko *) after several specimens from the Altai. Bej-Bienko, in describing his species, says that it is closely allied to *St. ehnbergi*, Mir., and was inclined to regard it as subspecies of the latter. Thanks to the kindness of the author,

* Trudy Sibirskoi Selsk. Akad. v. p. 47 (1926).

I was able to study a pair of specimens of his species, and I came to the conclusion that it is a good species, differing well from all the others of this genus. *St. intermedius* is not allied to *St. ehnbergi*, Mir. (this last species proved to be* a pure synonym of *St. fallax*, Zub.), but it is closely related to *St. hammarstroemi*, Mir., from which it differs, however, by venation of the elytra, structure of pronotum, form of the antennal joints, as well as by the structure of male internal genitalia.

Chorthippus kozhevnikovi, Tarb.

1925. *Chorthippus kozhevnikovi*, ♂, Tarbinsky, Konowia, iv. Heft. 3–4, p. 135, fig. 2.

♀. Rather slender. Head broad, compressed laterally. Antennæ as long as head and pronotum together. Front strongly reclinate, in profile straight (angle between the vertex and the front being 45°). Frontal ridge with distinct keels, below ocellum sulcate, above it flat, punctured. Fastigium of the vertex triangular, horizontal, flat, rounded in front. Frontal ridge, when looking at the head from above, not prominent. Foveolæ of the vertex long, distinctly impressed, with sharp margins. Disc of the pronotum slightly tectiform, with the hind margin obtusely angulated. Lateral lobes of pronotum almost vertical; their hind margin slightly excised and forming with the lower margin a narrowly-rounded angle, nearly 90°; lower margin in the anterior portion roundly sinuate. Transverse sulcus placed well behind the middle of the pronotum, distinctly obtusely angulate forwards. Lateral keels very feebly inflexed, almost parallel in prozona and somewhat divergent in metazona. Meso- and metapleuræ slightly and sparsely punctured. Elytra abbreviated, pointed, reaching to the middle of the hind femora, with rather regular transverse veinlets. Wings by one-third shorter than elytra. Hind femora slender, long. Valvæ of the ovipositor with strongly bent apical teeth, lower ones with sharp, broadly-rounded lobes before the apex.

Coloration as in the male, pale reddish. From the eyes begins a broad dark stripe, which goes through the upper half of the lateral lobes on to the elytra, the fore portion of elytra being darkened as far as the vena medialis. Hind femora unicolorous, yellowish brown, hind tibia bluish grey.

---

* Revue Russe d'Ent. xix. p. 186 (1925).

	mm.
Length of body	20?
„ pronotum	4
„ elytra	10
Width of elytra	2·8
Length of hind femora	14

The type of female from Perovsk, Syr-Darja, 31. vi. 1908, collected by V. Nikolsky.

This good species, described by me last year after a single male, was found in the materials of the Zoological Museum of the Russian Academy of Sciences in nine specimens, 6 ♂ ♂ and 3 ♀ ♀. Three males belong to forma *macroptera*, the dimensions of which are as follows :—

	mm.
Length of body	18·5
„ pronotum	3·5–3·8
„ elytra	15·5–16
Width of elytra	4·4
Length of hind femora	11·6–12

ECLIPOPHLEPS, gen. nov.

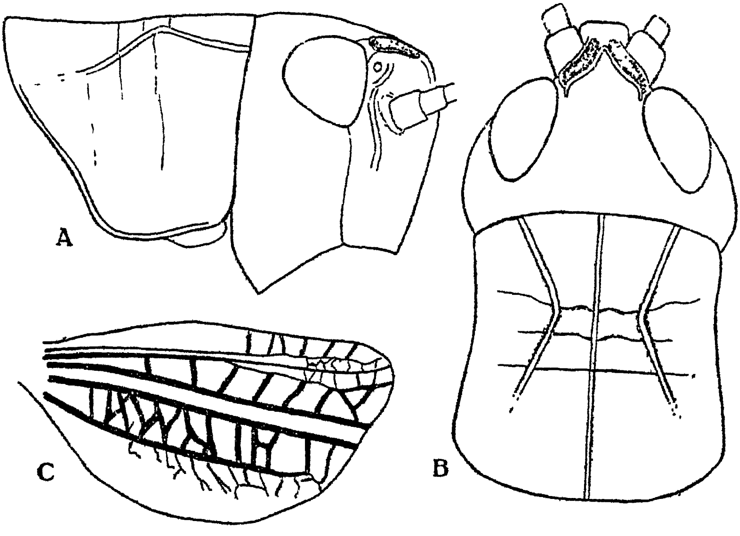
♂. Head thick, broad, strongly inflated. Antennæ relatively short, very feebly incrassate towards the apex. Frontal ridge in profile feebly reclinate, when looking at the head from above prominent. Lateral facial keels strongly S-shaped curved, obsolescent below. Foveolæ of the vertex broad, distinctly impressed, almost entirely dorsal and nearly contiguous apically. Eyes comparatively small, broad, with slightly prominent fore margin and with the hind margin broadly rounded. Pronotum broad, rounded, subcylindrical, lateral keels strongly angulately inflexed in prozona, obliterate in metazona. All three transverse sulci well developed, the last one is placed a little behind the middle of disc. Lateral lobes of the pronotum strongly narrowing downwards, below half as long as above. Prosternum with two longitudinal lateral furrows, which unite behind forming slightly convex transverse interspace between them. Elytra very short, practically semicircular. Venation of elytra highly irregular, reduced; principal veins and veinlets incrassate, the first one straight and not branched. No wings. Abdomen short and stout with a longitudinal keel above. Tympanum reduced. Anal plate triangular. Subgenital pale short, obtuse. Cerci short, thick, a little curved inwards. Legs thick.

Genotype: *Eclipophleps bogdanovi*, sp. n.

Eclipophleps bogdanovi, sp. n. (Fig. 4.)

Of middle size for the group, rather clumsy. Antennæ a little longer than the head and pronotum taken together. Head short, inflated, not prominent above the pronotum. Frons slightly reclinate, seen in profile forms a rounded angle with fastigium. Frontal ridge very broad, almost flat, sparsely punctured, with the margins obsolescent towards the clypeus. Fastigium of vertex broadly triangular, a little impressed, with margins concave, its apical angle acute. Eyes very broad and low. Distance between the lower margin of cheek and the eye distinctly longer than the height of the eye. Distance between the hind margin of the eye and the pronotum much less than distance between the frontal ridge and fore margin of the eye, and so is the width of the eye. Pronotum broad, rounded, with fore and hind margins slightly roundly excised. Lateral keels strongly angulately inflexed in prozona, strongly divergent backwards, in metazona obliterate. Typical sulcus placed almost in the middle of the pronotum. Median keel rather high. Lateral lobes of the pronotum not flat, with a little sloping fore margin and strongly sloping excised hind margin; the lower margin

Fig. 4.



Eclipophleps bogdanovi, gen. et sp. n., ♂, type.

slightly concave in front; the lower hind angle broadly rounded. Metazona and the hind half of the lateral lobes punctured. Elytra semicircular, by far not reaching the middle of hind femora, with sparse irregular transverse veinlets. Subcostal vein thin. Radial vein almost straight. Cubital and first anal veins united. Third and anal vein free, reaching almost to the margin of elytra. Discoidal field rather broad with not many irregular thick veinlets. Anal field broad. Front and middle legs thick, short; hind femora moderately incrassate. The last tergite of the abdomen with two small lobes. Anal plate triangular, feebly sulcate basally and with two feeble transverse wrinkles, its lateral margins slightly raised. Subgenital plate short, obtuse, curved up.

Coloration brown above. Frons and cheeks reddish yellow. Pronotum with two indistinct dark stripes along the lateral keels. Lateral lobes with shining black spot of irregular form; hind femora unicolorous reddish brown, with darker knees. Hind tibiæ dirty yellow.

	mm.
Length of body	15
„ pronotum	3·4
„ elytra	3·5
„ hind femora	8·7

The male type taken near the coast of lake of lower Kobdo, N.W. Mongolia, by Mr. P. K. Kozlov, early in August 1899.

This very interesting grasshopper, unfortunately represented by a single male only, has the characters which do not permit me to refer it to any of the known genera. Superficially it resembles a *Gomphocerus*, but differs from it as strongly as from any other genus of the group Gomphocerini, in which this new genus must be placed. The genus *Eclipophleps* is easily recognised by its short inflated head, broad subcylindrical pronotum, the upper position of temporal foveolæ, and the shape of eyes, as well as by the shape and exceedingly reduced venation of elytra. There is no subcostal vein; cubital and first anal veins (ulnar veins of authors) entirely fused; transverse veinlets not numerous, but thick, and it is remarkable that they appear between the anal veins, where they are not present generally.

I name the species in honour of my friend, Mr. N. N. Bogdanov-Katjkov, Director-founder of the Institute of Applied Zoology and Phytopathology, Leningrad, an indefatigable worker in Applied Entomology.

PTYGONOTUS, gen. nov.

Antennæ filiform with short articles, the middle ones only half again as long as broad. Face distinctly reclinate. Frontal ridge flat or a little convex, forms with fastigium a rounded angle; its lateral margins obliterate below ocellum. Facial keels very nearly obliterated. Fastigium of the vertex triangular with obtuse apex. Foveolæ of the vertex absent. Eyes broad, with the fore margin almost straight. Ocelli not well developed, but they are present. Pronotum subcylindrical, covers the head almost to the eyes, the distance between it and the eyes in the male much less than that between the eyes and the frontal ridge. Disc of pronotum tectiform; its fore margin obtusely projecting and its hind margin strongly angulately excised in the middle. Median keel well raised. Lateral keels well developed, angulately inflexed in the middle of prozona, strongly diverging backwards, straight in metazona. Lateral lobes of pronotum short, irregularly concave and convex. Typical transversal sulcus placed well behind the middle of the disc. Prosternum as in *Eclipophleps* m. Mesosternal lobes transverse with broadly rounded internal angle; the interspace between them broadly transverse. Metasternal lobes short and broad, its interspace in ♂ subquadrate, in ♀ transverse. Sternum in sparse impressed dots. Metasternum in the part not covered by the pronotum with a longitudinal keel above. Abdomen compressed laterally, with well-developed median longitudinal keel along its whole length and with obtuse lateral keels on the first tergite only. Tympanum well developed, open. Elytra lanceolate, narrowing towards the apex, lateral. Hind femora long and slender.

♂. Anal segment angulately excised in the middle. Anal plate broad, flat, rounded, with acute triangular lobes at the apex. Cerci long, extending beyond the apex of the anal plate. Subgenital plate acute, conical, with a longitudinal keel above.

♀. Anal plate long, triangular. Valvæ of the ovipositor long and narrow, the lower ones with rather large tooth.

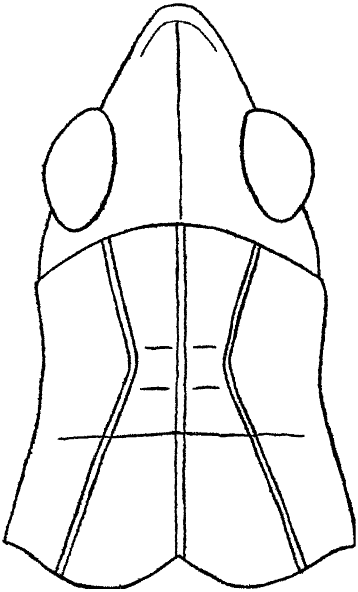
Genotype: *Ptygonotus semenovi*, sp. n.

Ptygonotus semenovi, sp. n. (Fig. 5.)

♂. Rather slender. Head short, compressed laterally. Face strongly reclinate. Antennæ a little longer than the head and pronotum taken together, flattened near the base and apically. Vertex rounded triangular, without foveolæ.

Frontal ridge broad, slightly convex, a little impressed below ocellum and flat above it, forming a rounded angle with fastigium. Eyes broad; subocular distance about as long as the height of an eye. Pronotum subcylindrical with obtusely projecting front margin; hind margin angulately excised with the sides of the excision rounded. Lateral keels angulately inflexed, strongly divergent backwards. Typical sulcus placed well behind the middle of disc, which is tectiform. Lateral lobes rugulose with the lower margin truncate in front. Elytra lateral, narrowly lanceolate, not reaching the end of the third tergite. Venation irregular, but well distinct. Abdomen compressed laterally with a distinct longitudinal keel above. Tympanum broadly open, the last tergite broadly triangularly excised in the middle, with two small lobes laterally. Anal plate semicircular, triangularly pointed apically. Subgenital plate elongate, conical, with a rather distinct keel above. Cerci long, cylindrical, pointed, a little incurved. Hind femora narrow.

Fig. 5.



Ptygonotus semenovi, gen. et sp. n., ♂, type.

General coloration uniformly reddish brown. Hind femora yellowish brown. Hind tibiæ red.

♀. As the male, but more clumsy. Fastigium of the vertex reclinate, forming with the frontal ridge a broadly rounded angle. Frontal ridge flat, with only a very small impression near ocellum. Antennæ shorter than head and pronotum together. Elytra dilated behind the middle, reaching a little behind the first tergite. Valvæ of the ovipositor narrow, long, lower ones with obtuse broad projection. General colaration yellowish brown. Lateral keels crossing broad stripes of velvet colour. Hind tibiæ red.

	♂ (type). mm.	♀ (paratype). mm.
Length of body	14	22
„ pronotum	3	4
„ elytra	3·5	4
„ hind femora	9·5	11

One male type and one female paratype taken by Mr. Berezovsky at Sampan, prov. Setchuan, China, 9500 feet and higher, in summer 1894. One male paratype taken at the river Gan-su, Chojsian, 3000 feet, 5–20. vii. 1892.

The species is named after Mr. A. P. Semenov-Tian-Schansky, President of the Russian Entomological Society, whose numerous and valuable works on systematics and zoo-geography of insects are well known to all entomologists.

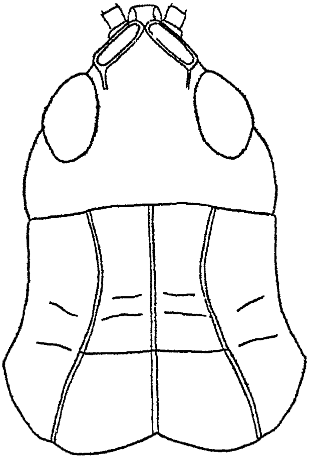
OREOPTYGONOTUS, gen. nov.

Similar to *Dysanema*, Uv. Compressed laterally. Head thick. Antennæ short, with sharply defined joints. Face rather strongly reclinate, straight or slightly concave in profile. Fastigium of the vertex triangular, slightly sloping. Foveolæ well impressed, elongate, almost quite dorsal with well-expressed margins, contiguous apically, forming an acute angle. Frontal ridge broad, distinctly sulcate in the middle. Eyes short and broad. Ocelli very small. Subocular distance a little longer than the height of an eye. Pronotum elongate, its disc distinctly longer than broad, feebly tectiform. Median keel linear, well developed. Lateral keels distinct. Typical transverse sulcus developed and placed behind the middle. Hind margin of pronotum rounded, obtusely excised in the middle, exposing the short mesonotum. Lateral lobes as high as long. Sternum smooth. Mesosternal lobes twice as long as broad, broadly separated. Metasternal lobes very short and broad, their interspace subquadrate. Metanotum and abdomen with a distinct dorsal keel. Elytra rudimentary, lateral. Tympanum undeveloped. Hind femora relatively short. Hind tibiæ without apical spine on the outer side. Valvæ of the ovipositor rather long and narrow.

Genotype: *Oreoptygonotus tibetanus.*

This new genus is close to *Dysanema*, Uv., described by Mr. B. P. Uvarov *, from Mount Everest, but differs well from it in some important points, as follows:—Pronotum in *Dysanema* is very short, in ♀ it is even broader than long, without transverse sulci, and it does not cover the mesonotum, while in the new genus the pronotum is longer than broad with well-developed hind typical sulcus and with two other sulci also visible; mesonotum is almost completely covered by pronotum. The vertex without a carinula and the presence of elytra also separate the new genus from *Dysanema*. From *Ptygonotus*, m., to which the new genus is also closely allied, it differs very well by the presence of temporal foveolæ and the absence of developed tympanum. These three genera, together with *Hypernephia*, Uv. †, form a well-characterized group of Acridinæ, which differs from remaining genera of this subfamily by the structure of pronotum, hind margin of which is obtusely excised; elytra in this group are absent or strongly reduced in both sexes.

Fig. 6.



Oreoptygonotus tibetanus, gen. et sp. n., ♀, type.

---

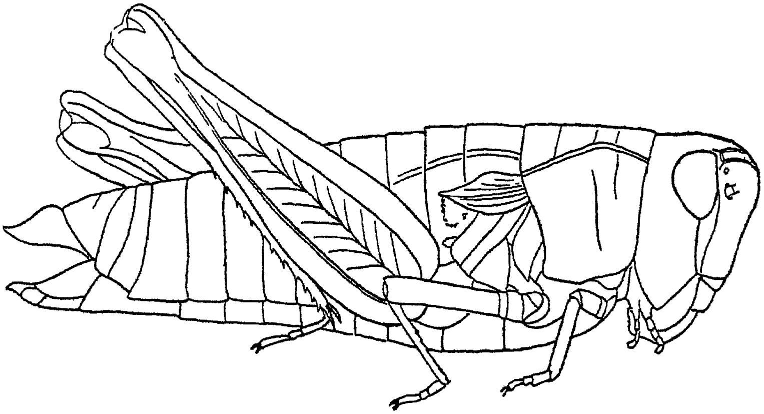
* Ann. & Mag. Nat. Hist. ser. 9, xvi. p. 168 (1925).

† *Loc. cit.* ix. p. 551 (1922).

Oreoptygonotus tibetanus, sp. n. (Figs. 6 & 7.)

♀. Small. Head short, inflated laterally. Antennæ shorter than the head and pronotum together, with short articles. Face rather strongly reclinate, in profile a little concave. Fastigium of the vertex triangular, slightly sloping. Foveolæ well developed with sharply-defined margins. Frontal ridge broad, broadly sulcate in the middle, between antennæ and near the clypeus flat, forms with fastigium broadly rounded angle. Eyes short and broad. Ocelli very small. Facial keels irregular, curved. Pronotum broadly dilated behind, feebly tectiform above, with the disc distinctly longer than broad, its hind margin angulately excised in the middle. Lateral keels well developed, roundly inflexed in the middle of prozona, strongly diverging behind. Transverse sulcus placed behind the middle of disc. Lateral lobes of pronotum with almost straight fore margin and with distinctly excised hind margin; lower margin slightly ascending in front and behind; the fore angle broadly rounded, hind angle straight with rounded apex. Elytra lateral, broadly lanceolate, acute, not exceeding the end of the first tergite. Metanotum and abdomen with a distinct longitudinal median keel above throughout; the first and second tergite as well as metanotum with callous lateral keels. Tympanum undeveloped; hind femora relatively short and broad, gradually narrowing

Fig. 7.



Oreoptygonotus tibetanus, gen. et sp. n., ♀, type.

towards the apex. Valvæ of the ovipositor rather long, lower ones with a rounded tooth.

Coloration green or reddish brown with darker marks. Two velvety stripes run along the lateral keel of pronotum and on the sides of abdomen; hind femora reddish brown, with two indistinct dark spots above and with indefinite dots on the lower keel. Hind tibiæ dirty yellow. Sternum and abdomen yellow below.

	mm.
Length of body	15·5
„ pronotum	2·8
„ elytra	2
„ hind femora	8·6

The female type is from the Eastern shores of the lake Orin-Nor in the basin of Hoang-ho, 13,900 feet, end of v. to beginning of vi. 1901, collected by Mr. P. K. Kozlov. Two female paratypes and larvæ are from the following localities:—River Bi-tchu in the basin of the Azure River, 14,000 feet, 11. vii. 1900, ♀; valley of the river Djagin-gol, Tibet, 14,300 feet, 1–6. vii. 1900 (larvæ) (*P. K. Kozlov* leg.).

All types and paratypes of the new species described in this paper are in the Zoological Museum of the Russian Academy of Sciences, Leningrad. I am obliged to Mr. B. P. Uvarov for his valuable advice in the preparation of this paper, and I wish to express here my thanks to him for the assistance.

LXIV.—*A Revision of the Genera and Species contained in Lendenfeld's 'Die Chalineen des australischen Gebietes.'*—II.

By MAURICE BURTON, M.Sc.

V. THE GENUS *CHALINISSA*, LENDENFELD, 1887 E, p. 771.

Genotype: *C. dissimilis* (Bowerbank), Lendenfeld, 1887 E.

No genotype has hitherto been named. I here name the first species included in the genus by Lendenfeld as the genotype. The species will be dealt with in the same order as that in which they were tabulated by Lendenfeld (*l. c.*).

1. *Chalinissa dissimilis* for *Isodictya dissimilis* (Bowerbank), 1866 B.

This is an *Axinella*, so that the genus *Chalinissa* must be now regarded as a synonym of *Axinella*, since this species is the genotype.

2. *Chalinissa lobata* for *Pachychalina lobata*, Ridley, 1884 c.

This is an undoubted *Cladochalina*, possibly synonymous with *C. armigera*.

3. *Chalinissa macrodactyla* for *Pachychalina macrodactyla*, Ridley, 1884 c.

An undoubted *Chalina* with a characteristic external form and appearance. Other synonyms of the species, which I have discovered by comparing the material at my disposal, are *Chalinorhaphis digitata*, Lendenfeld, *Reniera longimanus*, Dendy, and *R. proxima*, Dendy.

4. *Chalinissa megalorhaphis* for *Pachychalina megalorrhaphis*, Ridley & Dendy, 1887.

A true *Chalina*, differing very little from *Chalina macrodactyla* (vide supra).

5. *Chalinissa pedunculata* for *Pachychalina pedunculata*, Ridley & Dendy, 1887.

A true *Chalina*. There is no special dermal skeleton in this or in the preceding species, so that they are distinctly related to *Chalina oculata* and must be included in the same genus.

6. *Chalinissa gracilis* for *Veluspa polymorpha*, var. *gracilis*, Maclay, 1870 A.

From the original description and from the examination of numerous specimens from a neighbouring locality identified by Dendy (MSS.) as *Reniera gracilis*, there can be no doubt that this species is merely a synonym of *Reniera cinerea* (*sensu* Burton, 1926 B).

7. *Chalinissa arctica* for *Veluspa polymorpha*, var. *arctica*, Maclay, 1870 A.

I have seen no example of this species, but from the original description one may reasonably infer it to be a Cladocroce.

8. *Chalinissa digitata* for *Veluspa polymorpha*, var. *digitata*, Maclay, 1870 A.

I have little hesitation in declaring this a synonym of *Chalina oculata*.

9. *Chalinissa communis* et varr. *flabellum, digitata*, Lendenfeld, 1887 E.
Also *Chalinissa communis*, var. *tenuis*, Thum, 1904 A.

According to Whitelegge (1901 A) the species is very abundant in Australian waters, and, as is not unusual in sponges, it is also very variable. So much is this so that I do not see any reason why the three so-called varieties enumerated above should be used, since they represent only the normal variations of the species. Except for the external form, the species differs little from *Cladochalina armigera* and its allies, and must be included in the same genus.

10. *Chalinissa macropora*, Lendenfeld, 1887 E.

Closely related to the foregoing, this must be included in the same genus.

11. *Chalinissa tenuifibris*, Lendenfeld, 1887 E.

Possibly a synonym of *C. communis*, Lendenfeld.

12. *Chalinissa serpens*, Lendenfeld, 1887 E.

Almost certainly a synonym of *C. communis*.

13. *Chalinissa elegans*, Lendenfeld, 1887 E.

An undoubted synonym of *C. communis*.

14. *Chalinissa rigida*, Lendenfeld, 1887 E.

An undoubted synonym of *C. communis*.

15. *Chalinissa elongata*, Lendenfeld, 1887 E.

An undoubted synonym of *C. communis*.

16. *Chalinissa elongata*, var. *tenuispicula*, Thum, 1904 A.

From the author's description this appears to be nothing more than a further synonym of *C. communis*.

17. *Chalinissa ramosa*, Lendenfeld, 1887 E.

This, again, may prove to be a synonym of *C. communis*.

18. *Chalinissa megaloraphis*, Lendenfeld, 1887 E.

= *Chalina megalorrhaphis*, vide (4).

19. *Chalinissa oblata*, Lendenfeld, 1887 E. (Misprint for *C. lobata*.)

This, the *Pachychalina lobata* of Ridley, appears to be closely related to *Cladochalina subarmigera*, and, provisionally at all events, will be included in the same genus.

20. *Chalinissa macrodactyla*, Lendenfeld, 1887 E.
= *Chalina macrodactyla*, vide (3).

SUMMARY OF THE SPECIES OF *CHALINISSA* AND THEIR PRESENT SYSTEMATIC POSITION.

C. dissimilis = *Axinella dissimilis* (Bowerbank).
C. lobata = *Cladochalina lobata* (Ridley).
C. macrodactyla = *Chalina macrodactyla* (Ridley).
C. megalorhaphis = *Chalina megalorrhaphis* (Ridley & Dendy).
C. pedunculata = *Chalina pedunculata* (Ridley & Dendy).
C. gracilis = *Reniera cinerea* (Grant).
C. arctica = *Cladocroce arctica* (Maclay).
C. digitata = *Chalina oculata* (Pallas).
C. communis = *Cladochalina communis* (Lendenfeld).
C. communis, varr. *flabellum*, *digitata*, *tenuis* = *Cladochalina communis* (Lendenfeld).
C. macropora = *Cladochalina macropora* (Lendenfeld).
C. tenuifibris = *Cladochalina tenuifibris* (Lendenfeld).
C. serpens = *Cladochalina communis* (Lendenfeld).
C. elegans = *Cladochalina communis* (Lendenfeld).
C. rigida = *Cladochalina communis* (Lendenfeld).
C. elongata = *Cladochalina communis* (Lendenfeld).
C. elongata, var. *tenuispicula* = *Cladochalina communis* (Lendenfeld).
C. ramosa = *Cladochalina communis* (Lendenfeld).

VI. THE GENUS *PACHYCHALINA*, SCHMIDT, 1868, p. 8.

Genotype: *P. rustica*, Schmidt, *l. c.*

This, the next genus of the Chalinine sponges, offers some degree of uncertainty as to what its author intended it to include. It is possible to fix characters for the genus which differ from those of *Chalina*, although these, as will be seen, do not agree entirely with the generally accepted ideas pertaining hitherto. I have already (Burton, 1926 A) shown that it is not sufficient to say that the genus *Pachychalina* differs from the genus *Chalina* in that the fibres of the main skeleton contain more rows of spicules, as has hitherto been the case, but that we must find something more definite and stable on which to fix the limits of the genus. Schmidt's description of the genotype leaves much to be desired. In fact, we may say that for purposes of modern study it is worthless. The hologenotype itself is, for the moment, apparently irretrievably lost, or at most is not available for re-examination. A preparation in the British Museum contains only a few strands of the fibre of the main skeleton, and offers no clue. The species has only been recorded once since, by Topsent (1901 c), who doubtfully referred two small specimens to the species. Here, again, the knowledge gained from Topsent's remarks in this instance do not throw any more light on the matter, from my point of view. Moreover, these specimens have been irretrievably lost, as I have ascertained by inquiries through Professor Topsent himself. The all-important point which must be determined is whether the genotype of this genus possessed a special dermal skeleton or not. I cannot stress the importance of this feature of the anatomy too much as a sound basis of classification in the Chalininæ, if not in all sponges. For four years I have devoted special study to the classification of the Haplosceridæ in general and to the Chalininæ in particular. As a result of this study, it is evident that the Chalinine sponges, however we may subdivide them into genera, belong to two large groups, those like *Chalina oculata* without a special dermal skeleton, and the others with a stout well-developed special dermal skeleton. The former are for the most part somewhat finer in texture, the meshes of the skeleton-fibres are usually smaller and more regular, while the sponges themselves are most abundant in the Northern Hemisphere. The latter are tougher, with much coarser skeleton, and are found chiefly in the Southern Hemisphere. Here we have two comparatively well-marked groups of sponges, whose main distinction rests on the presence or absence of a special dermal skeleton. This latter feature is, like all other characteristics of sponges, subject to a certain amount of variation, *but* it is never missing from any individual of a species which ordinarily possesses it. This feature, therefore, constitutes a first-class criterion for purposes of classification. These remarks are the result of the study of many hundreds of Chalinine sponges, with special attention paid to the matter of the dermal skeleton. Now Schmidt's account of the genotype leaves us in doubt as to whether it possessed a special dermal skeleton or not. From the only microscopic preparation of the sponge I have seen it is evident that if such a skeleton were absent it would be difficult to separate it from the genus *Chalina*. Topsent's specimens of the species would appear from the figure (*l. c.* pl. xiii fig. 4) to be devoid of a dermal skeleton, but this author admits of a doubt concerning the accuracy of his identification. On the other hand, Schmidt (1870, p. 37), reviewing the genus, says, "Die Fasern werden von innen nach aussen zu feiner, gehn nicht in Pinsel aus, sondern bilden ein zarteres Oberflachennetz." This to my mind settles the matter definitely that the second group of Chalinine sponges with the special dermal skeleton was the one for which Schmidt intended his genus *Pachychalina*. Even so, to accept the genus as valid in the present state of uncertainty in which we find it will be to store up possible trouble for the future. In such a preliminary work as this, in which it is only intended to restore some sort of order in the Chalininæ with a view to a more intensive study when the quite hopeless confusion now prevailing has been, at least, partially eradicated, it is necessary to make what may eventually prove to be only provisional measures. Although the various species of Chalininæ possessing a special dermal skeleton are here all placed indiscriminately into the next valid genus after *Pachychalina* in order of time (namely, *Cladochalina*), it may be found necessary as time goes on to further subdivide them into closely-related but distinct genera. If such a division prove necessary, I am convinced that it will be based on the characters of the dermal skeleton to a very large extent. Since we do not know the character of the dermal skeleton in *Pachychalina*, as Schmidt conceived it to be, and only that it possessed one of some sort, it is clear that to retain *Pachychalina*, although only temporarily, is most likely to prove merely a matter of "postponing the evil day" when it must be abandoned. To save all possibility of further trouble and confusion, I propose to abandon the genus now, taking the absence of exact knowledge of the genotype as my excuse.

The species are dealt with in the same order as that in which they appear in Lendenfeld (1887 E).

1. *Pachychalina grantii* for *Chalina grantii*, Bowerbank.
=*Reniera cinerea*, vide Burton, 1926 B, p. 420.

2. *Pachychalina caulifera*, Vosmaer, 1882 B.

From Lundbeck's (1902) description of this species I can see no other course than to regard it as a synonym of *Chalina oculata*.

3. *Pachychalina compressa*, Schmidt. 1870 A.
=*Homœodictya palmata*, vide Lundbeck, 1905, p. 121

4. *Pachychalina elongata*, Ridley & Dendy, 1887.

A true *Cladochalina*.

5. *Pachychalina excelsa*, Schmidt (1870).

From the meagre information available this might be *Chalina oculata*, but nothing certain can be said.

6. *Pachychalina fibrillosa*, Ehlers, 1870.

From the re-description of Esper's *Spongia fibrillosa* the species would appear to be without a special dermal skeleton, but our knowledge of the species is so small that we can only regard it as a *sp. dub.*

7. *Pachychalina punctata*, Ridley & Dendy, 1887.

The well-developed dermal skeleton of this species renders it a very close ally indeed of *Cladochalina armigera*.

8. *Pachychalina rustica*, Schmidt, 1868.

As already noted this is a *sp. dub.*

9. *Pachychalina spinulosa*, Lendenfeld, 1887 E.

A true *Cladochalina*.

10. *Pachychalina paucispina*, Lendenfeld, 1887 E.

This, like several of the succeeding species, is seen to be an obvious synonym of *Cladochalina dendroides* when the holotypes of the two species are compared.

11. *Pachychalina ramulosa* et varr., Lendenfeld, 1887 E.

= *Cladochalina dendroides*.

12. *Pachychalina manus*, Lendenfeld, 1887 E.

A true *Cladochalina*.

13. *Pachychalina macrospina*, Lendenfeld, 1887 E.

A true *Cladochalina*.

14. *Pachychalina elegans*, Lendenfeld, 1887 E.

= *Cladochalina dendroides*.

15. *Pachychalina rigida*, Lendenfeld, 1887 E.

A true *Cladochalina* and a possible synonym of *C. dendroides*.

16. *Pachychalina oculata*, Lendenfeld, 1887 E.

An undoubted synonym of *Cladochalina elegans.*

SUMMARY OF ALL THE SPECIES OF *PACHYCHALINA* AND THEIR PRESENT SYSTEMATIC POSITION ACCORDING TO THE METHOD OF CLASSIFICATION ADOPTED ABOVE, GIVEN IN ALPHABETICAL ORDER.

P. acapulensis, Wilson, 1904 A = *Cladochalina acapulcensis.*

P. affinis, Bronsted, 1924 = *Cladochalina affinis.*

P. alveolopora, Topsent, 1906 B = *Cladochalina alveolopora.*

[This species has a very strong resemblance to *Dactylochalina viridis*, with which I suspect it to be synonymous. I have examined several specimens of this species from the Red Sea, including the holotype, and can without hesitation declare Row's *Ophlitaspongia digitiformis* to be a synonym of it. Possibly all three species are one and the same thing.]

P. amaranthus (Duch. et Mich.), Wilson, 1902 A = *Cladochalina amaranthus.*

P. areolata, Wilson, 1902 A = *Cladochalina areolata.*

P. aurantiaca, Dendy, 1895 = *Cladochalina aurantiaca*, vide Lendenfeld, 1887 E.

P. aurantiaca, var. *dura*, Whitelegge, 1902 A = *Cladochalina aurantiaca*, var. *dura.*

P. australis, Whitelegge, 1906 A = *Cladochalina bilamellata*, Carter.

P. bilamellata, Dendy, 1895 = *Cladochalina bilamellata*, Carter.

[Carter (1885 H) described a sponge from Australia which he believed to be *Spongia bilamellata*, Lamarck. Ridley, 1881 D, showed that this was not the case. Carter's sponge was re-named *Cavochalina bilamellata*, and, although it proved to be a different thing to the Lamarckian species, there is no reason why the name should not stand as a Carter species. Now known as *Cladochalina bilamellata* (Carter), the species is a very common constituent of the Australian sponge-fauna of which the British Museum possesses numerous specimens. It is somewhat variable in external form and appearance, but is always bilamellate or semi-infundibuliform, and the various varieties have been used quite unnecessarily as the basis for the erection of so-called species, all of which must now be regarded as synonyms of Carter's species, and as such they will appear in these pages.]

P. brevispiculata, Dendy, 1905 A = *Cladochalina brevispiculata.*

P. caulifera, Vosmaer, 1882 B = *Chalina oculata*.

P. cellulosa, Verrill, 1907 A = *Chalina*? *cellulosa*.

P. claviformis, Dendy, 1895 (for *Acervochalina claviformis*, Carter) = *Halichondria claviformis*.

P. communis, Whitelegge, 1901 A = *Cladochalina communis*.

P. compressa, Schmidt, 1870 A = *Homœodictya compressa*.

P. conica, Brφndsted, 1924 = ? *Cladochalina conica*.

P. conulosa, Kieschnick, 1898 = *Cladochalina joubini*, Topsent.

P. de bueni, Ferrer, 1921 = *Cladochalina de bueni*.

P. delicatula, Dendy, 1889 C = *Cladochalina delicatula*.

P. densa, Brφndsted, 1923 = ? *Cladochalina densa*.

P. diffusa (Ridley), var. *affinis*, Hentschel, 1912 A = *Cladochalina diffusa*, var. *affinis*.

P. elastica, Verrill, 1907 A = *Chalina*? *elastica*.

P. elegans, Lendenfeld, 1887 E = *Cladochalina dendroides*.

P. elongata, Ridley & Dendy, 1887 = *Cladochalina elongata*.

P. excelsa, Schmidt, 1870 A = *Chalina*? *excelsa*, sp. dub.

P. fibrosa, Ridley & Dendy, 1887 = *Cladochalina fibrosa*.

P. fibrillosa, Ehlers, 1870 = *Cladochalina fibrillosa*, sp. dub.

P. fragilis, Ridley & Dendy, 1887 = *Cladochalina fragilis*.

P. furcata, Keller, 1889 A = *Chalina viridis*, Keller.

[I have examined the holotype and find that it differs from *Chalina viridis* in no respect other than the external form.]

P. gracilenta, Ferrer, 1922 (for *Chalina gracilenta*).

[This is a synonym of *C. limbata*, the genotype of *Acervochalina*, a genus which it will be necessary to revive.]

P. grantii, Lendenfeld, 1887 E = *Reniera cinerea* (vide supra).

P. hospitalis, Stephens, 1915 A = *Chalina hospitalis*.

P. irregularis, Swarcevsky, 1905 (for *Cacochalina irregularis*, Czerniavsky) = *Acervochalina limbata*.

P. joubini, Topsent, 1897 A = *Cladochalina joubini*.

P. limbata, Ferrer, 1914 C = *Acervochalina limbata*.

P. lobata, Ridley, 1884 C = *Cladochalina lobata*.

P. lunæ, Brφndsted, 1924 = *Cladochalina lunæ*.

P. macrodactyla, Ridley, 1884 C = *Chalina macrodactyla* (*vide* under *Chalinissa*).

P. macrospina, Lendenfeld, 1887 E = *Cladochalina macrospina*.

P. magellanica, Thiele, 1905 (I have examined the holotype and find this species to be a *Halichondria*) = *Halichondria magellanica*.

P. manus, Lendenfeld, 1887 E = *Cladochalina manus*.

P. megalorhaphis, Ridley & Dendy, 1887 = *Chalina megalorhaphis* (*vide* under *Chalinissa*).

P. melior, Ridley & Dendy, 1887 = *Cladochalina melior*.

P. melior, var. *tubulifera*, Lindgren, 1897 A = *Cladochalina melior*, var. *tubulifera*.

P. micropora, Verrill, 1907 A = *Chalina ? micropora*.

P. millepora, Verrill, 1907 A = *Chalina ? millepora*.

P. mollis, Wilson, 1902 A = ? *Cladochalina mollis*.

P. montaguii, Ferrer, 1914 C = *Reniera cinerea* (*vide* Burton, 1926 B).

P. monticulosa, Verrill, 1907 A = *Chalina ? monticulosa*.

P. multiformis, var. *manaarensis*, Dendy, 1889 C = *Cladochalina multiformis*, var. *manaarensis*.

P. nigra, Baer, 1905 A.

[This is certainly not a true member of the Chalininæ. Its nearest relation appears to be *Phakellia weltneri*, Lendenfeld, also from the coast of Zanzibar. Since it does not conform with the genotype of *Phakellia*, but is most probably an Axinellid, I propose to call it *Axinella ? nigra* provisionally.]

P. oculata, Lendenfeld, 1887 E = *Cladochalina elegans*.

P. odessana, Kudelin, 1910 A = *Acervochalina odessana*.

[This is probably a synonym of *A. limbata*.]

P. paucispina, Lendenfeld, 1887 E = *Cladochalina dendroides*.

P. pedunculata, Ridley & Dendy, 1887 = *Chalina pedunculata* (*vide* under *Chalinissa*).

P. punctata, Ridley & Dendy, 1887 = *Cladochalina punctata*.

P. ramosa, Whitelegge, 1906 A = *Cladochalina communis* (*vide* under *Chalinissa ramosa*).

P. ramulosa, Lendenfeld, 1887 E = *Cladochalina dendroides*.

P. reticulosa, Thiele, 1905 A = *Cladochalina reticulosa*.

P. rigida, Lendenfeld, 1887 E = *Cladochalina rigida*.

P. rubens (Pallas), Wilson, 1902 A = *Cladochalina rubens*.

P. rustica, Schmidt, 1868 A = sp. dub. (? or *nomen nudum*).

P. schmidtii, Lundbeck, 1902 A = *Chalina schmidtii*.

P. spinilamella, Dendy, 1889 C = *Cladochalina spinilamella*.

P. spinosissima, Dendy, 1887 E = *Cladochalina fibrosa*.

P. spinulosa, Lendenfeld, 1887 E = *Cladochalina spinulosa*.

P. subcylindrica, Dendy, 1905 A = *Cladochalina subcylindrica*.

P. tenella, Dendy, 1905 (for *Chalinella tenella*, Lendenfeld, *q. v.*) = *Cladochalina elegans*.

P. tenera, Thiele, 1905 A = *Reniera ignobilis*, Thiele, *l. c.*

[The holotype has little spongin, and altogether the skeleton approximates to that which we should call Renierid. I can see no essential difference between this species and *R. ignobilis*, and have here regarded them as synonymous.]

P. validissima, Thiele, 1905 A = *Cladochalina validissima*.
[This is a somewhat aberrant *Cladochalina*.]
P. variabilis, Dendy, 1887 D = *Cladochalina variabilis*.
P. magellanica, Thiele, 1905 A.

[This species is an undoubted *Halichondria*, and is probably indistinguishable from *Pellinella conica*, Thiele. Both species recall very strongly the Halichondrias of the Indian Ocean and Australasian waters, most of which have hitherto been assigned to the genera *Reniera*, *Schmidtia*, *Protoschmidtia*, etc., but which differ from *Halichondria panicea*, the genotype of *Halichondria*, chiefly in the smaller size of the spicules. *Reniera cribricutis*, Dendy, *R. semifibrosa*, Dendy, etc., are all good Halichondrias, and resemble very markedly the two species of Thiele referred to above.]
= *Halichondria magellanica*.

LXV.—*On a small Collection of Reptiles from Morocco*. By Baron G. J. DE FEJÉRVÁRY, Ph.D., F.Z.S. France, H.M. Malta H.S.S., Reader in the R. Hung. Elizabeth University (Pécs), Curator, in charge of the Herpet. Coll., Hung. Nat. Museum (Budapest).

THE Zoological Department of the Hungarian National Museum purchased, about a month ago, a small collection of Reptiles collected in Morocco by a Hungarian fellow of the French Légion des étrangers. Unfortunately, the exact localities have not been designated. The material deserves, however, to be dealt with, partly because of the variation to be observed in the respective species, and partly because of the necessity of completing and deepening our knowledge of the Morocco herpetological fauna.

Agamidæ, Fitz. (1826), emend. Gray (1827) (sensu Blgr.).

Agama bibroni, A. Dum.

(Mus. Hung. Rept. No. 2813/2.)

Two adult specimens, one male and one gravid female. They pretty well agree with Mr. Boulenger's description of the species given in his Catalogue (vol. i. p. 357). A slight divergence from his data might, however, be stated in the following points: ear-opening not larger than the slit formed by the eyelids; third finger very slightly, though visibly, longer than fourth, in the female more so than in the male; length of fourth and fifth toe somewhat exceeding the distance between hind corner of eye-slit and the nostril; gular region in female as strongly plicated as to form a rather well-defined gular pouch with a distinctly denticulated outline.—The shield bearing the parietal organ is misnamed by Boulenger (*l. c.*) as the occipital, though being the homologon of the interparietal shield in other Lacertilians.—In the male there are two rows of sub-oblong præanal plates, the posterior row presenting very feeble indications of pores.

Coloration olive-brown above, the region from tip of snout to somewhat behind the origin of fore limbs being almost black in the male, the same colour reappearing in the sacral region, between the origin of hind limbs, extending over them as well as over the tail*. In the female the dorsal and lateral surfaces of the head are of a somewhat darker brown, this coloration strictly keeping to the dorsal confines of the skull, *i. e.*, not extending, in the middle region, to the part overlying the vertebral column and bearing the low nuchal crest. Some sepia-brown spots are present on the light dorsal surfaces in both sexes. Lower surfaces of male from tip of snout to about the middle region of sternum of a very dark brown, nearly black, the belly being white, ventral surface of thighs and anal region yellowish, faintly strewn with blackish and greyish dots, the lower side of crures, feet, and tail white, piebald with dark grey to black, this design being due to the fact of every scale presenting, in its middle part, the dark colour, whilst its confines are remaining light. The region between the gular fold and the posterior limit of neck is yellowish, strewn with grey. Lower surfaces of female uniform white, turning into butter-yellow in the region of gular pouch and on the ventral surface of limbs, this colour being especially well marked in anal region and on lower surface of thighs and basis of tail. Eight narrow grey longitudinal stripes of irregular course, and leaving about equal interstices between one another, originating at the grey lower labials and running down to the gular pouch, ending at its anterior limit.

The species seems to be the only *Agama* occurring in Morocco, also referred to in the respective faunistical notes by Boulenger (4), Pellegrin (8, 9, 10), and Zulueta (12).

---

* I cannot establish whether this coloration is the original one, or perhaps due, at least to a certain extent, to the action of formaldehyde. The specimens figured by Boulenger (4, pl. xiii. fig. 1) do not present like differentiations in their livery.

Uromastix acanthinurus, Bell, var. *pluriscutata*, nov.

(Mus. Hung. Rept. No. 2813/1.)

An adult specimen measuring about 290 mm. from tip of snout to end of tail, most primitively prepared, eviscerated, and stuffed with cotton-wool, and obtained so in dry condition. Presently preserved in alcohol. Though muscologically in a rather undesirable state, it is perfectly fit for any examination so far as exterior morphological markings are concerned. The specimen agrees with Mr. Boulenger's description of the type-form of the species (2, vol. i. pp. 406-407), differing from it, however, in the considerably higher number of transversal rows of ventral plates (or, rather, scales). *Uromastix acanthinurus*, Bell, s. str., counts "about ninety" scales "on the middle line of the belly, from the gular fold to the præanal pores", the number of the respective series being, also according to Anderson (1, p. 131), "80 to 90" "between the inguinal and gular folds", whilst in the present individual there are **120** rows of ventrals counted in the median line from gular fold to præanal pores. *U. acanthinurus*, Bell, var. *pluriscutata*, is, thus, with respect to the character just referred to, intermediate between *U. acanthinurus*, Bell, s. str., and *U. ægyptius* [Hasselq. & L.], Forsk., the latter species, which inhabits Egypt, Crete, and Arabia, counting 140 transverse series of ventrals.

Coloration pale greyish brown above, turning into a slightly greenish yellow in the median region of back, this colour vanishing again in the sacral region. Neck and head vandyke-brown, presenting lighter insterstices, which are of a greenish yellow in the præfrontal region. Dark vandyke-brown to sepia-brown vermiculations all over the dorsal surface, ranged, from somewhat before the middle region of trunk, into four irregular transverse bands. The livery somewhat reminds, thus, that of *U. ornatus*, Heyd., as described by Anderson (1, p. 129). Dorsal surface of tail of the same colour as anterior part of back, bestrewn with dark brown longitudinal spots, following the shape of the spined caudal scales. Lower surfaces uniform, of a dirty yellowish white, with brown designs on the mandibles and on the chest.

In the literature consulted it is only Pellegrin who records, in his last paper (10, p. 316), *Uromastix* from Morocco (Oued Tatta and Mogador) *.

---

* According to Boulenger (4, p. 119), "*U. acanthinurus* is not recorded west of Algeria or east of Tunisia."

Uromastix acanthinurus, Bell, s. lat., comprises thus *four* systematically distinguishable forms: *U. acanthinurus*, Bell, s. str., *U. a.*, var. *nigriventris*, Rothsch. & Hart. (*cf.* 11, pp. 467–468), *U. a.*, var. *nigerrima*, Hart. (*cf.* 6, pp. 79–80), and *U. a.*, var. *pluriscutata*, Fejérv.

Lacertidæ, Gray (1827), emend. Cope (1864).

Lacerta ocellata, Daud., subsp. *pater*, Lat., var. *tangitana*, Blgr.

(Mus. Hung. Rept. No. 2813/3.)

This variety was described by Boulenger (2, vol. iii. pp. 13–14) in 1887; it has not, however, been much considered since. Boulenger again dealt with it, in a more detailed way, in 1895 (4, pp. 124–125). The differences separating var. *tangitana* from subsp. *pater*, Lat., s. str., are not very important, so that Werner (13, p. 162) refers to it as constituting a "kaum wesentlich verschiedene Form". The differences are, nevertheless, evidently subsisting, and might be resumed in the following: size decidedly smaller than in *pater*, Lat., s. str., approaching hereby the habitus of *Lacerta viridis*, Laur. Occipital smaller than in the typical subsp. *pater*, its greatest width not exceeding that of the frontal measured at its broadest part. 77 to 100 scales across middle of body. Generally 8 longitudinal rows of ventral plates—as in subsp. *pater*, Lat., s. str.—but sometimes 6 rows only. 17 to 21 femoral pores.

The male specimen under inspection measures but 96·5 mm. from snout to vent, though the fully developed femoral pores, bearing a well-marked comb of secretion, as well as the general habitus of the head and body, point towards its *perfect sexual maturity*. Length of tail 72·6 mm. Greatest width of occipital equalling that of frontal. 70 scales across middle of body and 8 longitudinal rows of ventral plates. Femoral pores 17 on both the right and left sides.

Coloration much altered, because of the action of formaldehyde. The ground-colour was evidently green, reticulated and vermiculated with black. Indications of ocelli at both sides of vertebral column. Belly uniform, its original colour cannot be established.

In its size, forms, and livery the specimen strikingly resembles *L. viridis*, Laur., subsp. *schreiberi*, de Bedr. It is the smallest adult individual of var. *tangitana*, Blgr., I know recorded in literature. Var. *tangitana* seems to incline to pygmeism.

Acanthodactylus boskianus, Daud., var. *asper*, Daud.

(Mus. Hung. Rept. No. 2813/7.)

One adult male specimen. Snout but a little longer than postocular part of head. Fourth toe reaching somewhat beyond collar. First supraoculars entire, fourth ones nearly so, split only in their distal marginal part into four smaller granules, forming, so to say, the continuation of the superciliary granules. Four supralabials anterior to the subocular shield, the first of which is, on the left side, hypertrophically developed, leaving but little space for the development of the postnasal. 32 gular scales in the longitudinal median line. 13 collar-plates. Medial dorsal scales abruptly differentiated from the dorso-laterals; 35 dorsals across the middle of body, and 10 between the hind limbs, the latter ones not much smaller than the basal caudals. Ventral plates in 10 longitudinal series. Femoral pores 26 on the right and 25 on the left side. 19 lamellæ under the fourth toe. 23 scales in the fifth caudal whorl. Finally I must point to the fact that the gular scales are smooth, even the larger ones near the collar, and not "imbricate," as stated by Boulenger (5, p. 84).

With respect to the livery, the conservation of the juvenile character ought to be recorded, consisting of a well-marked longitudinal striation, offering the complete series of striæ and vittæ, as established by Prof. de Méhely regarding the livery in *Lacerta* (*cf.* 7, pp. 423–424 and fig. 1), and agreeing with Anderson's figure of the young (1, pl. xx. fig. 4).

I communicated more detailed data concerning this specimen, because of the well-known variability of individuals and species in the genus *Acanthodactylus*, partly expressively pointed out in, and partly simply standing out from, Boulenger's respective descriptions (in 5).

Chamæleontidæ, Gray (1825), emend. Cope (1864).

Chamæleon vulgaris, L.

(Mus. Hung. Rept. No. 2813/5.)

Two adults, one semi-adult, and one juvenile specimen. Tail in one adult and in the juvenile very considerably longer than head and body together, a little longer than this length in the other adult, and considerably shorter in the semi-adult. According to Boulenger (2, vol. iii. p. 443) the tail is "usually a little shorter than head and body in the Western specimens, a little shorter in the Eastern." This might be, in general, a rule; I should like, however, to emit the supposition, very suggestive to me, that this dimensionary difference may, perhaps—at least to a certain degree—be dependent on sex. Eidonomical characters, lepidosis and coloration normal.

Colubridæ, Oppel (1811), emend. Gray (1849) (sensu Blgr.).

Natrix viperina, Latr.

(Mus. Hung. Rept. No. 2813/4.)

One half-grown and one young specimen. Lepidosis and coloration normal.

Emydidæ, Gray (1825) (sensu Fejérv.*).

Clemmys leprosa, Schweigg.

(Mus. Hung. Rept. No. 2813/6.)

One soft-shelled, apparently new-born individual. The lateral dorsal keels of the carapace are distinct in it, a character stated by Boulenger (3, p. 105) to occur in the "newly-born specimens only."

Hungarian National Museum, Dept. of Zoology, March 22nd, 1927.

---

* I consider the members of the family Testudinidæ, Gray (1825) (sensu Blgr.), as belonging to *two different families*, viz., to the Testudinidæ, Gray (1825) (sensu Fejérv.), with the generotype *Testudo*, L. (sensu Blgr.), and to the Emydidæ, Gray (1825) (sensu Fejérv.), with the generotype *Emys*, Dumér. (sensu Blgr.).—*Cf.* Fejérváry, Rept., in: Nagy Alföldünk Állatvilága (a paper on the Animals of the Hungarian Great Plain), A Debreceni Tisza István Honism. Bizotts. Tud. Közl., I. Debrecen, 1925, p. 137, footnote 6. (In this paper there are, unfortunately, numerous misprints, because of the editor's not having given me the last proofs to revise before impression. On p. 137, footnote 5 bears upon the term "**Testudinimorpha** mihi" [14th line from above], and footnote 6 upon the word "**Emydidæ**" [16th line from above]. The author of the subfamily "**Emydinæ**" is Stejn. [=Stejneger] and *not* "Stein.," &c.)

TERMINOLOGICAL NOTE.—The term "*genotype*," which was invented by systematists, having been illegally appropriated by students of Heredity, the systematists, not being able to exterminate, any more, this preoccupated term in literature on *Heredity*, are constrained, in view of clearness and precision, to adopt another term for their original conception. I follow, therefore, Professor Dudich, who proposed to designate, in *Systematics*, the type-species of a genus with the word "*Generotype*" (*cf.* Dudich, in: Zool. Anz., lx., Leipzig, 1924, p. 154, footnote). Grammatically, both expressions, "genotype" and "generotype," are correct, the first being drawn from the Greek, the second from the Latin. In connection with this I have to remark that the expressions "*Genoholotype*" and "*Genolectotype*" are merely meant to designate the *historical kind* of the *typus*

LITERATURE CITED.

1. **Anderson**, J., Reptilia and Batrachia, in: Zool. of Egypt, London, 1898.
2. **Boulenger**, G. A., Catal. of the Lizards in the Brit. Mus., 2nd edit., London, 1885 (vol. i.), 1887 (vols. ii. & iii.).
3. ——, Catal. of the Chelonians &c. in the Brit. Mus., new edit., London, 1889.
4. ——, Catal. of the Rept. and Batr. of Barbary (Morocco, Algeria, Tunisia), based chiefly upon the Notes and Collections made in 1880–1884 by M. Fernand Lataste, Trans. Zool. Soc. London, xiii., London, 1895, pp. 93–164, pls. xiii.–xviii.
5. ——, Monograph of the Lacertidæ, ii., London, 1921.
6. **Hartert**, E., Reptiles and Batrachians, in: Expedition to the Central Western Sahara, Nov. Zool., xx., 1913, London and Aylesbury, 1913–1914, pp. 76–84.
7. **Méhely**, L. v., Materialien zu einer Systematik u. Phylogenie d. muralis-ähnlichen Lacerten, Ann. Mus. Nat. Hung., vii., Budapest, 1909, pp. 408–621, tab. x.–xxv.
8. **Pellegrin**, J., Reptiles, Batraciens et Poissons du Maroc (Mission de Mme Camille du Gast), Bull. Soc. Zool. France, 37, 1912, Paris, 1912, pp. 255–262.
9. ——, Rept., Batr. et Poissons du Maroc (récoltés par le Dr. H. Millet), *ibid.*, pp. 262–264.
10. ——, Liste des Rept., Batr. et Poissons d'eau douce des coll. du Musée de l'Institut Scientifique Chérifien de Rabat, Bull. Soc. des Sc. Nat. du Maroc, v., 1925, Rabat, Paris, Londres, MCMXXV (Achevé d'imprimer le 27 Septembre, 1926), pp. 315–321.
11. **Rothschild**, the Hon. W., and **Hartert**, E., Ornithological Explorations in Algeria, Nov. Zool., xviii., 1911, London and Aylesbury, 1911–12, pp. 456–550, pls. ix.–xi., xv.–xxvi.
12. **Zulueta**, A. **de**, Notre sobre reptiles de Melilla (Marruecos), Bol. R. Soc. Esp. Hist. Nat., ix., 1909, Madrid, 1909, pp. 351–354.
13. **Werner**, F., Lurche u. Kriechtiere, II., in: Brehm's Tierl., 4. Aufl., Leipzig u. Wien, 1913.

generis or *generotype*. and they have, thus, no bearing at all upon the essential, *i. e.*, systematical, significance of this term. They represent, in my opinion, but historically intended *divisions* of the very same systematical conception *generotype*, *both* entering into its frame, so that *generotype* may be correctly used in every case, viz., in that of a genoholotype as well as in that of a genolectotype, both having the full systematical signficance the term generotype implies. Besides, it often occurs that we know of a species representing the type of a genus, without, however, being thoroughly informed about its typological history, and in many cases we may, in general, refer to it merely as "*generotype*," not committing hereby any unexactness or even uncorrectness.—The conception attached to the term "*syntype*" does not enter any more into the sphere of the conception of the term *generotype*, the basic idea upon which the latter relays *eo ipso* secluding it from its ideological confines: *Generotype* is only *one* species, whilst of syntypes a large number may occur. Strictly speaking, the expression "syntype" is of no true typological value; and, in spite of that, no one seriously needed in systematical terminology.

LXVI.—*On a Fossil Cyprinodont from Ecuador.*
By Errol Ivor White, Ph.D., F.G.S.

(Published by permission of the Trustees of the British Museum.)

A fine series of fossils from the Leaf-beds of Loja, Ecuador, has recently been presented to the British Museum by Professor Clodoveo Carriòn, of the National College of Loja. Leaves form the bulk of the collection, but there are also diminutive gasteropods (*Pyrgula*) and many small Cyprinodont fishes referable to a single new genus and species. The Leaf-beds are very fissile whitish shales, and the contained fossils are impressions without any trace of organic matter, but often still showing the finest details.

H. Engelhardt (1895), in his study of the plants, came to no definite decision as to their age, except that they were Tertiary; but E. W. Berry (1918, pp. 634, 640), by a general comparison with the Central-American floras, concluded that their age was either Upper Oligocene or Lower Miocene, and in his table (ibid. p. 648) definitely refers them to the early part of the latter formation. Although the fishes do not throw any further light on the subject, yet they are of interest, for they belong to a subfamily—the Cyprinodontinæ—not previously recorded from South America either as fossil or recent (see C. H. Eigenmann, 1922, p. 179, and C. T. Regan, 1911, p. 323).

Carrionellus, gen. nov.

Diagnosis.—Oviparous Cyprinodonts with small mouth and oblique mandible; teeth long, tricuspid, arranged in at least two rows; dorsal and anal fins similar in both sexes, the former short, posteriorly placed, and arising directly opposite the origin of the longer anal.

Genotype.—*C. diu-mortuus*, sp. n.

Material.—The holotype in counterpart (P. 14320–1) and twenty-seven paratypes, of which three are in counterpart (P. 14322–50).

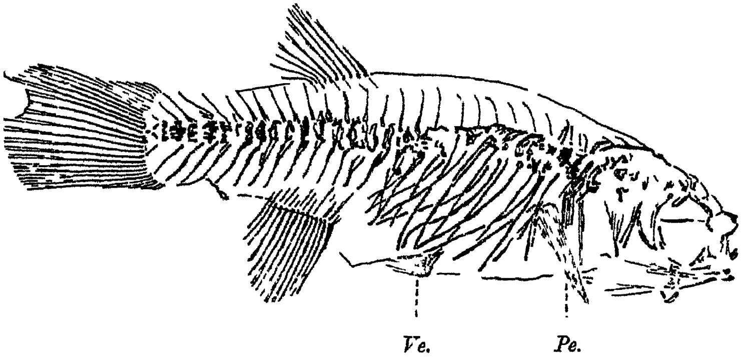
Form. and Loc.—(?) L. Miocene; Loja, Ecuador.

Description of Specimens.—The holotype is preserved in side view with mouth open; the premaxilla, however, is not protruded, nor are the details of the teeth visible. The specimen is complete except for the tips of the ventral fins, and the preservation is excellent, although the abdominal vertebræ and ribs are slightly confused, and the dorsal fin is further forward than is usual.

The largest complete specimen (P. 14324) is 4·2 cm. long, but the remainder do not exceed 3·2 cm. in length except one, represented by an isolated vertebral column (P. 14340), which must have belonged to a fish at least 6·4 cm. in total length.

The shape is typically fusiform and the snout obtuse. The head and opercular apparatus are contained four and a quarter times in the total length, are approximately equal to the maximum depth, and double the caudal depth.

The physiognomy and the details of the skull-roof are very similar to those of the living *Cyprinodon*, but two specimens (P. 14323, 27) suggest that parietals were present. The length of the orbit is about one-third that of the head and opercular apparatus, and it slightly exceeds the interorbital width (P. 14327).



Carrionellus diu-mortuus, gen. et sp. n.

Left-hand impression of holotype (P. 14320). The pectoral and parts of the dorsal and anal fins are drawn from the counterpart (P. 14321). × 3.

Pe.=pectoral fin; *Ve.*=imperfect ventral fins.

The cleft of the mouth is small and the mandible short and oblique, lying at an angle of 45° to the horizontal (P. 14325, 44). In a number of specimens the premaxilla is protruded (P. 14346, 49). The teeth are long (P. 14331) and tricuspid (P. 14323, 39), and appear to lie in at least two rows (P. 14323, 27, 28, 45). The pharyngeal plates bear numerous microscopic teeth (P. 14335). The details of the branchial series are obscure, but P. 14328 shows a good view of the isthmus and underside of the head.

The backbone is composed of twenty-eight vertebræ (P. 14326), of which the first bears no ribs and is never clearly distinguishable owing to the overlap of the operculum; there follow eleven rib-bearing abdominals and sixteen caudals, the hindmost being modified as a urostyle (P. 14324, 25, 31). The centra are somewhat longer than high, and are strengthened with two or three longitudinal ridges (P. 14336). The intermuscular bones are long and slender (P. 14331).

The fin-formula is:—

D.=10; A.=14; C.=28–30; P.=13+(?6); V.=7.

The dorsal fin, of ten rays, arises somewhat behind the middle of the back, above the second caudal vertebra. The fin in the holotype (fig.) appears to be complete, in spite of the delicacy of the bifurcated distal ends of the rays. In shape it is roughly triangular, with the third ray the longest. The height of this fin exceeds the length of its base by two-thirds, and is somewhat greater than the depth of the caudal pedicle.

The anal fin has fourteen rays, and its origin is immediately opposite that of the dorsal (in the holotype the posterior position of the anal fin is due to slight distortion). It is longer and rather more rounded than the dorsal, but in height they are equal. An intromittent organ is absent, and there are no signs of sexual characters, such as are found in *Cyprinodon*, in either dorsal or anal fin.

The truncated tail is composed of twenty-eight to thirty rays, of which the first half-dozen or so above and below are short and neither articulated nor bifurcated distally (P. 14324, 26, 34 c). The length of this fin is equal to the distance between the anterior border of the orbit and the branchial opening.

The base of the pectoral fin lies vertically and is placed high on the side. The short anterior ray is followed by twelve long, segmented, bifurcated rays and at least six smaller graduated elements (P. 14342). The length of the pectoral fin exceeds the distance between its origin and that of the ventrals; extended posteriorly it would reach the level of the tenth abdominal vertebra (P. 14321, 31).

The ventral fins have seven rays apiece (P. 14321, 28). They are situated midway between the pectoral and anal fins, and their length is rather greater than two-thirds of the interval between their origin and the anal fin (P. 14331, 33).

The large scales are arranged in approximately thirty-three vertical rows, of which seven are on the head and opercular apparatus and twenty-six behind the gill-slit. The maximum number in a row is about ten (P. 14331). Typically cycloid and closely resembling those of *Cyprinodon*, they are almost circular, and exhibit the usual concentric growth-lines and six or more longitudinal grooves on the overlapped anterior area.

Remarks.—The tricuspid teeth and the absence of secondary sexual characters refer *Carrionellus* to the Cyprinodontinæ of Regan's classification (1911, p. 323). The multiple row of teeth provides a valid generic distinction from living genera, which is further emphasized by the position and uniformity of the dorsal and anal fins.

These characters also distinguish *Carrionellus* from *Pachylebias*, from the Upper Miocene of the Mediterranean region (A. S. Woodward, 1901, p. 295), which is the only other fossil genus definitely assigned to the same subfamily, and one remarkable for the hyperostosis of the axial skeleton. Among the other fossil Cyprinodonts, *Prolebias* (Woodward, ibid. p. 290) seems to be a true Funduline, but of the remainder sufficient is not known about the characters of the dentition and fins for their systematic position to be clear: the Pleistocene *Parafundulus* from Nevada (C. R. Eastman, 1917, p. 291) and S. California (D. S. Jordan, 1924, p. 45) is not clearly distinguished from living genera; *Gephyrurus*, from the (?) Oligocene of S. Dakota, has a forwardly-placed dorsal fin, a small pectoral of nine rays, and seemingly no hypural (E. D. Cope, 1891, p. 654); *Brachylebias*, from the (?) Miocene of Persia, is said to be near *Prolebias*, and has but twenty-three to twenty-four vertebræ (F. Priem, 1908, p. 21); and in the French Lower Miocene genus *Pœcilops* the dorsal fin is opposed to the ventrals (H. E. Sauvage, 1874, p. 195).

LITERATURE.

BERRY, E. W. 1918. Bull. Geol. Soc. America, vol. xxix.
COPE, E. D. 1891. Amer. Naturalist, Philad. vol. xxv. p. 654.
EASTMAN, C. R. 1917. Proc. U.S. Nat. Mus. vol. lii. p. 290.
EIGENMANN, C. H. 1922. Mem. Carnegie Mus. vol. ix.
ENGELHARDT, H. 1895. Abh. Senckenb. naturf. Gesell. vol. xix.
JORDAN, D. S. 1924. Bull. S. Calif. Acad. Sci. vol. xxiii. p. 45.
PRIEM, F. 1908. In J. de Morgan, "Délégation en Perse," Ann. Hist. nat. vol. i.
REGAN, C. T. 1911. Ann. & Mag. Nat. Hist. (8) vol. vii. p. 320.
SAUVAGE, E. 1874. Bull. Soc. Hist. nat. Toulouse, vol. viii.
WOODWARD, A. S. 1901. Cat. Foss. Fishes B.M. pt. iv.

LXVII.—*Revision du Genre* Heteromycteris, *Kaup* [*Pisces Heterosomata Soleiformes*]. Par PAUL CHABANAUD.

LE genre *Heteromycteris*, Kaup, comprend, à l'heure présente, cinq espèces distinctes ; il doit être rangé dans la sous-famille des Achirinæ.

La mise au point de nos connaissances actuelles sur la composition de ce genre *Heteromycteris* n'a pu être réalisée que grâce à l'étude simultanée des spécimens conservés dans la collection du Muséum National d'Histoire naturelle (Paris), où se trouvent notamment les types de Kaup, et des nombreux exemplaires que possède le British Museum.

Je prie M. Tate Regan, F.R.S., Directeur du British Museum (Natural History), ainsi que M. J. R. Norman, Assistant, de trouver ici l'expression de ma vive gratitude pour l'extrême courtoisie avec laquelle ils ont facilité mes recherches dans les collections dont ils ont la charge.

HETEROMYCTERIS.

Heteromycteris, Kaup, Arch. Naturg. xxvi. 1, 1858, p. 103 (*Heteromycteris capensis*).

Amate, Jordan & Starks, Proc. U.S. Nat. Mus. xxxi. 1906, p. 228 (*Amate japonica*) ; Jordan, Univ. Calif. Public., Zool. t. xxvi. no. 1, p. 11 (1923).

Heteromycteris, Jordan, Copeia, no. 136, 1924, p. 99.

Monodichthys, Chabanaud, Bull. Mus. Nat. Hist. nat. Paris, 1925, p. 356.

Formes allongées. Museau unciforme, longuement prolongé sur la mandibule. Narine postérieure de la face oculée percée au-dessus du sillon circumbuccal, devant l'œil ventral. Tube nasal antérieur de la face aveugle légèrement dilaté distalement ; languette très développée, entière ou ramifiée. Membrane operculaire non soudée à l'isthme. Premier rayon de la dorsale inséré sur l'appendice unciforme du museau et près de l'extrémité de cet appendice, souvent au-dessous du niveau même de la bouche ; les rayons les plus longs insérés sur le milieu du corps ; l'extrémité de la nageoire arrondie par suite du raccourcissement des derniers rayons ; le dernier rayon pourvu d'une membrane postérieure généralement rudimentaire. Pas de pore à la base des rayons de la dorsale ou de l'anale. Caudale oblongue ; ses rayons externes courts. Pectorales nulles ou représentées par un certain nombre de rayons sétiformes, courts, soutenant la membrane cleithrale. Pelviennes dyssymétriques ; la pelvienne droite médiane, prolongeant l'anale et composée de 5 rayons ; sa base longue ; la pelvienne gauche latérale et composée de 5 ou de 4 rayons ;

son 1er rayon symétrique au 3ème ou au 4ème rayon de la pelvienne droite ; son dernier rayon attaché au dernier rayon de la pelvienne droite. Rayons médians de la caudale simples ou bifides ; tous les autres rayons des nageoires simples. Dorsale et anale nues, rarement squameuses sur la face oculée seule. Papille urinaire insérée contre la base du 1er rayon de l'anale, aussi longue ou presque aussi longue que ce rayon, étroitement attachée, jusqu'à son sommet, à ce même rayon, par la membrane reliant la pelvienne droite à l'anale. Angle de l'urohyal très aigu. Septum interbranchial ouvert. Hæmapophyses vertébrales soudées distalemant par paires.

Orthotype. *Heteromycteris capensis*, Kaup.

Atlantique oriental et sud ; région indo-pacifique.

1. Lèvre inférieure de la face oculée ciliée. Tous les rayons de la caudale simples .... 2.

2. Appendice unciforme du museau ne dépassant pas, en arrière, l'aplomb de l'œil dorsal. Languette * du tube nasal antérieur de la face aveugle ramifiée. Diamètre de l'un des yeux représentant les 66 à 83 % de l'espace oculo-dorsal †. Pelvienne gauche formée de 5 rayons .... *capensis.*

2a. Appendice unciforme du museau atteignant ou dépassant en arrière le 1er rayon de la pelvienne droite. Languette du tube nasal antérieur de la face aveugle entière. Diamètre de l'un des yeux représentant les 15 à 30 % de l'espace oculo-dorsal. Pelvienne gauche formée de 4 rayons .... *proboscidea.*

1a. Lèvres de la face oculée non ciliées. Rayons médians de la caudale bifides. Appendice unciforme du museau ne dépassant pas, en arrière, l'aplomb de l'œil dorsal. Pelvienne gauche formée de 5 rayons . 3.

3. Languette du tube nasal antérieur de la face aveugle ramifiée. D. 90 à 103. Sq. circa 94 .... 4.

4. Dorsale et anale squameuses sur la face oculée. Spinules marginales des écailles libres .... *hartzfeldi.*

4a. Dorsale, anale et pelviennes entièrement nues. Spinules marginales des écailles engainées dans l'épiderme, au moins chez les grands exemplaires. .... *oculus.*

3a. Languette du tube nasal antérieur de la face aveugle entière. Spinules marginales des écailles engainées dans l'épiderme, au moins chez les grands exemplaires. D. 83 à 88. Sq. circa 75................ ...... *japonica.*

---

* Valve cartilagineuse obturant, chez tous les Soléiformes, le lumen du tube nasal antérieur des deux faces du corps.

† Espace oculo-dorsal. Soit la plus courte distance comprise entre l'œil dorsal et le bord céphalique antéro-supérieur (dans le cas présent, base de la nageoire dorsale).

Heteromycteris capensis.

Heteromycteris capensis, Kaup, Arch. Naturg. i. 1858, p. 103 (type examiné) ; Gunther, Catalogue, iv. p. 462 (1862).

Achirus capensis, Boulenger, Marine Invest. in South Africa, i. p. 2 (1898) (spécimens examinés) ; Gilchrist, Mar. Invest. S. Afr. ii. p. 191, tab. i., fig. 16 (œuf) ; Barnard, Annals S. African Mus. xxi. 1925, p. 404.

Type. Muséum National d'Histoire naturelle (Paris).—D. 100. A. 69. Ecailles : entre la dorsale et la ligne latérale 21 ; en série longitudinale 87.

Exemplaires du British Museum.—D. 96 à 109. A. 66 à 77. Ecailles (en série longitudinale) 87 à 94.

Maximum de longueur totale observé : 121 millimètres (*type*).

°/$_{o}$ de la longueur du corps : hauteur 31 à 35 ; tête 22 à 25.—°/$_{o}$ de la longueur de la tête : œil 13 à 16 ; espace postoculaire 44 à 50 ; caudale 59 à 75.—°/$_{o}$ du diamètre de l'œil dorsal : espace oculo-dorsal 120 à 175.

Habitat.—Afrique du Sud. "Saldanha Bay, False Bay to East London, shallow water" [*Barnard*].

Heteromycteris proboscideus.

Monodichthys proboscideus, Chabanaud, Bull. Mus. Nat. Hist. nat. Paris, 1925, p. 356 ; id., Bulletin du Comité d'Etudes historiques et scientifiques de l'Afrique Occidentale Française, 1926, p. 282, figs. 31 et 32 ; id., Bull. Mus. Nat. Hist. nat. Paris, 1926, p. 53.

Types I. et II. Muséum National d'Histoire naturelle (Paris).—D. 108 à 113. A. 69 à 72. C. 15 ou 17. Pelvienne droite 5, gauche 4. Ecailles : entre la dorsale et la ligne latérale 19 ; en série longitudinale 90. Maximum de longueur totale observé : 71 millimètres.

°/$_{o}$ de la longueur du corps : hauteur 10 à 11 ; espace postoculaire 39 à 42 ; caudale 78.—°/$_{o}$ du diamètre de l'œil dorsal : espace oculo-dorsal 333 à 633.

Seuls, deux individus sont actuellement connus de cet unique représentant du genre *Heteromycteris* sur la côte occidentale d'Afrique. De même que dans presque toutes les autres espèces du même genre, la pectorale droite est représentée, sur l'un et l'autre de ces deux exemplaires, par un petit nombre de rayons (5 à 8) sétiformes, soutenant un pli de la membrane cleithrale. Ces rayons paraissent soumis à des variations numériques individuelles et peuvent, mais rarement, disparaître en totalité. Leur véritable nature ne m'était pas apparue clairement, tout d'abord, bien que j'en aie signalé la présence au cours de la description du premier exemplaire, trouvé à Port-Etienne*. Sur la face aveugle, la membrane cleithrale forme également un pli libre, au-dessous de son point d'union avec la membrane operculaire, mais ce pli n'est soutenu par aucun vestige de rayons.

La papille urinaire, très difficile à distinguer, est, selon la règle, dans ce genre *Heteromycteris*, étroitement attachée au 1^er^ rayon de l'anale et aussi longue que ce rayon.

Contrairement à ce qu'il m'avait semblé tout d'abord, la membrane operculaire n'est pas attachée à l'urohyal.

Habitat.—Côte occidentale d'Afrique : baie du Lévrier et Cameroun [*Monod*].

Heteromycteris hartzfeldi.

Achirus hartzfeldi, Bleeker, Tijdschr. Ned. Ind. iv. 1853, p. 123; id., Ned. Tijdschr. Dierk. i. 1863, pp. 250 et 265; id., ibid. ii. 1863, pp. 184 et 274; id., Arch. Néerl. Sc. Nat. xiii. 1878, p. 55; id., Atlas Ichthyol. p. 25, tab. ccxlvi. fig. 1 (1872).

Aseraggodes hartzfeldi, Kaup, Archiv Naturg. xxiv. 1, 1858, p. 103.

Solea hartzfeldi, Günther, Catalogue, iv. p. 471 (1862) (spécimen examiné).

Paratype : British Museum, *e museo Bleeker*.—D. 93. A. 64. Ecailles (en série longitudinale) : 94. Longueur totale : 104 millimètres †.

°/~0~ de la longueur du corps : hauteur 38 ; tête 22.—°/~0~ de la longueur de la tête : œil 15 ; espace postoculaire 40 ; caudale 75.—°/~0~ du diamètre de l'un des yeux : espace oculo-dorsal 233.

Contrairement à ce qui existe chez toutes les autres espèces du même genre, *Heteromycteris hartzfeldi*, Blkr., possède, sur la face oculée seule, une série d'écailles recouvrant chacun des rayons de la dorsale et de l'anale. L'unique exemplaire examiné présente trois séries longitudinales de taches sombres, vaguement circulaires et dont chacune est un peu plus grande que l'un des yeux.

Habitat.—Archipel Indo-malais.

Heteromycteris oculus.

Solea oculus, Alcock, Journ. As. Soc. Beng. lviii. 1890, p. 285, tab. xviii. fig. 3.

Spécimens du British Museum.—D. 91 à 100. A. 60 à 64. Ecailles : entre la dorsale et la ligne latérale 28 ; en série longitudinale 91 à 94. Maximum de longueur totale observé : 123 millimètres.

---

* Bull. Mus. Nat. Hist. nat. 1925, p. 358.

† Par suite d'une malformation accidentelle chez cet individu, la languette du tube nasal antérieur de la face aveugle est atrophiée.

°/₀ de la longueur du corps : hauteur 36 à 37 ; tête 24 à 25. —°/₀ de la longueur de la tête : œil 12 ; espace postoculaire 41 à 44 ; caudale 66 à 67.—°/₀ du diamètre de l'un des yeux : espace oculo-dorsal 250 à 257.

Les spinules marginales des écailles sont totalement engaînées, du moins chez les exemplaires adultes, dans l'épiderme, qui est considérablement épaissi. Sur le fond d'un brun jaunâtre clair, la face oculée est marquée d'une multitude de points noirs qui s'arrangent, le long de la base de la dorsale, le long de la base de l'anale et sur la ligne latérale, de manière à dessiner de grands cercles concentriques ; ces cercles sont disposés en trois séries longitudinales et chacun d'eux est beaucoup plus grand que l'un des yeux.

Habitat.—Golfe du Bengal.

Heteromycteris japonica.

Achirus japonicus, Schlegel, Fauna japonica, Poissons, 1846, p. 166.
Solea japonica, Günther, Catalogue, iv. 1862, p. 171.
Aseraggodes japonicus, Jordan et Snyder, Annot. Zool. Japon. 1901, iii. p. 122.
Amate japonica, Jordan et Starks, Proc. U.S. Nat. Mus. xxxi. 1906, p. 228, fig. 3 ; Jordan, Tanaka, et Snyder, Journ. Coll. Sci. Imp. Univ. Tokyo, xxxviii. 1913, p. 322, fig. 281.

Spécimens du British Museum.—D. 83 à 88. A. 59 à 60. Ecailles : entre la dorsale et la ligne latérale 24 ; en série longitudinale 72 à 82. Maximum de longueur totale observé : 163 millimètres.

°/₀ de la longueur du corps : hauteur 33 à 40 ; tête 23 à 25. —°/₀ de la longueur de la tête : œil 11 à 13 ; espace postoculaire 36 à 45 ; caudale 68 à 78.—°/₀ du diamètre de l'œil dorsal : espace oculo-dorsal 200 à 280.

Heteromycteris japonica, Schleg., diffère de *Heteromycteris oculus*, Alc., par la structure de son tube nasal antérieur de la face aveugle, dont la languette est entière et non ramifiée, par le nombre un peu plus réduit des rayons de sa dorsale (83 à 88, au lieu de 91 à 100), par le nombre beaucoup plus réduit de ses écailles (environ 75, au lieu de 94, en série longitudinale) et par son système de coloration. Chez *Heteromycteris japonica*, Schleg., en effet, la ponctuation noire est uniformément répartie sur toute la face oculée, sans dessiner les taches pleines ou les cercles concentriques que l'on voit sur *Heteromycteris oculus* et *hartzfeldi*. Toutefois, chez les exemplaires adultes de *H. japonica*, aussi bien que chez *H. oculus*, l'épiderme s'épaissit et engaîne tout entières les spinules marginales des écailles.

Habitat.—Japon méridional.

LXVIII.—*Sur* Achiropsis nattereri, *Stdr.*, *et* Apionichthys dumerili, *Kaup* [*Pisces Heterosomata, Soleiformes*]. Par PAUL CHABANAUD.

LA collection du British Museum possède un poisson de l'ordre des Heterosomata Soleiformes, qui me semble, après examen, devoir être rapporté, en dépit de quelques différences d'importance secondaire, à l'espèce qui a été décrite par Steindachner sous le nom de *Solea* (*Achiropsis*) *nattereri* *.

Les différences que j'ai notées entre l'exemplaire de Londres et le *type* d'*Achiropsis nattereri* sont les suivantes :

Type d'*Achiropsis nattereri*, Stdr., d'après la diagnose originale.—L'appendice unciforme du museau atteint le 1er rayon de la pelvienne droite. La largeur de l'espace interorbitaire est égale au diamètre de l'un des yeux. La longueur de la fente operculaire de la face oculée mesure le diamètre de l'un des yeux. La fente operculaire de la face aveugle mesure le double de ce même diamètre. La caudale est plus courte que la tête. D. 82. A. 50. Longueur totale : environ 23 centimètres.

Spécimen du British Museum.—L'appendice unciforme du museau recouvre tout le bord antérieur de la mandibule, sans atteindre la pelvienne. L'espace interorbitaire mesure, en largeur, le double du diamètre de l'un des yeux. La fente operculaire de la face oculée mesure, en longueur, le double du diamètre de l'œil. La fente operculaire de la face aveugle, plus ample, est égale à la longueur de la bouche. La caudale est un peu plus longue que la tête (104 °/o). D. 76. A. 57. Longueur totale : 282 millimètres.

Il semble que les yeux sont un peu plus petits, chez le second exemplaire, que chez le *type* de l'espèce.

Les proportions du corps, le nombre des écailles, le nombre des rayons des pelviennes et de la caudale correspondent exactement.

Ces deux individus ont été capturés dans les grands fleuves de l'Amérique du Sud : le *type*, dans le Rio Negro ; le second, dans le Rio Jurua (*Dr. Bach*, 1897).

L'exemplaire du British Museum présente une pelvienne gauche déviée latéralement et dont le premier rayon est inséré près de la base du troisième rayon de la pelvienne droite ; tous les rayons de cette pelvienne gauche sont reliés entre eux par une membrane bien développée ; le dernier rayon étant lui-même attaché, par une membrane, au dernier rayon de la pelvienne droite. Cet individu est totalement privé de dents ; la surface de ses deux mâchoires gauches, surface qui, normalement serait pourvue de dents, est recouverte d'une peau épaisse, analogue à ce qui existe chez les *Gymnachirus* ; malgré l'absence de dents, le dentaire gauche est assez fortement dilaté. De même que chez tous les Soleidæ, la valve respiratoire supérieure n'est séparée de l'inférieure que du seul côté droit, ces deux valves n'en formant qu'une seule, du côté gauche de la bouche ; chez l'individu en question, cette valve respiratoire présente, à la mâchoire supérieure gauche, un développement considérable. Le septum interbranchial est percé d'une large fenêtre.

---

* Sitzungsberichte math.-naturw. Classe K. Akad. Wiss. Wien, Band lxxiv, Abth. 1, 1876 (1877), p. 58.

Eu égard à la dentition, ainsi qu'à la structure de la pelvienne gauche, le mutisme de Steindachner est complet. On peut admettre, sous bénéfice d'inventaire, que les particularités que j'ai observées sur l'exemplaire du British Museum se retrouvent chez le type d'*Achiropsis nattereri*.

S'il en est ainsi, le genre *Achiropsis*, Stdr., ne se distinguerait du genre *Apionichthys*, Kaup, que par l'absence de dentition et par une moindre réduction de la pelvienne gauche. En effet, *Apionichthys dumerili*, Kaup (=*Soleotalpa unicolor*, Gthr.) possède une dentition normalement développée ; d'autre part, sa pelvienne gauche n'est composée que de 2 à 4 rayons grêles, courts et qui ne sont reliés les uns aux autres que par une membrane rudimentaire ; le dernier rayon étant lui-même privé de tout vestige de membrane postérieure et, par conséquent, sans aucune relation avec son homologue de la pelvienne droite.

Il se pourrait aussi qu'une comparaison directe entre les deux spécimens nommés *Achiropsis nattereri*, ou simplement un examen plus minutieux du *type* de cette espèce, révèle, entre ces deux spécimens, des différences plus profondes que celles qui apparaissent à la seule lecture de la description rédigée par Steindachner, et que ces différences fassent considérer l'exemplaire du British Museum comme appartenant à une espèce autre qu'*Achiropsis nattereri*. Cette espèce, à laquelle appartiendrait l'exemplaire du British Museum, serait nouvelle. En supposant que le *type* d'*Achiropsis nattereri* possède une dentition normale, il n'y aurait plus lieu de placer cette forme fluviatile dans un genre spécial et le nom d'*Achiropsis* deviendrait synonyme d'*Apionichthys*, antérieur en date.

La présence des dents ne devant plus, d'ores et déjà, être considérée comme constante chez les Apionichthyinæ (*Apionichthys, Achiropsis*), le groupe des Gymnachirinæ ne s'en distingue plus que par le perte de ses écailles ; l'absence totale de pectorale gauche, chez les *Gymnachirus*, n'ayant

plus grande signification, en raison de l'atrophie de ce membre déjà très accentuée chez *Apionichthys dumerili*.

Ainsi, la séparation de ces deux groupes apparaît purement artificielle * et seul doit subsister le groupe des Apionichthyinæ, comprenant les genres *Apionichthys*, *Achiropsis* et *Gymnachirus*. Par rapport aux Achirinæ (sensu stricto), les caractéristiques de ce groupe des Apionichthyinæ reposent : 1e, sur l'union de la membrane operculaire à la branche inférieure de l'urohyal, ployé en angle extrêmement aigu; 2e, sur l'énorme allongement de cette branche inférieure de l'urohyal, branche qui supporte le plus grand nombre des rayons de la pelvienne droite; et 3e, sur l'atrophie, plus ou moins complète, de la pelvienne gauche.

LXIX.—*Bees from the Malay Peninsula*.

By T. D. A. Cockerell.

Messrs. H. M. Pendlebury and C. Dover, of the Museum at Kuala Lumpur, are actively investigating the bee fauna of the Malay Peninsula. They will certainly make many discoveries, and throw much new light on the geographical distribution of these insects. Among those recently captured are some which, for various reasons, have proved difficult to identify, and at Mr. Pendlebury's request I am reporting on them.

Nomia strigata (Fabricius).

♀.—Selangor-Pahane, near Genting, Sempak Hill Station, Sept. 11 (*C. Dover*).

Halictus deliensis, Strand.

♀.—Selangor, Kuala Lumpur, April 2 (*Pendlebury*).

This species appears to have received six names, but, according to Blüthgen, the earliest one available is *H. deliensis* Strand, 1910.

Habropoda fulvipes, Cameron.

♀.—Peninsular Siam, Nakon Sri Tamarat, Khao Luang, 3000 ft., March 15 (*Pendlebury*).

---

* Jordan, 'Revision of Achirinæ' (Univ. Calif. Publ., Zool. xxvi. 1923); Chabanaud, "Les Soles de l'Atlantique oriental nord et des mers adjacentes" (Bull. Inst. Océan., Monaco, no. 488, 1927); Chabanaud, "Observations morphologiques et remarques sur la systématique des Poissons hétérosomes soléiformes" (Bull. Inst. Océan., Monaco, no. 500, 1927).

This is Cameron's *fulvipes* as described in the ♀; Cameron's ♂ does not belong. I have the true male (clypeus, labrum, supraclypeal mark, lateral face-marks, and most of mandibles orange-yellow; first two abdominal segments bright ferruginous; hind femora swollen) from the Khasia Hills (*Sladen*).

Anthophora insularis pahangensis, subsp. n.

♂ (type).—Length about 13 mm.

Abundantly clothed with red hair, mixed with black dorsally. Compared with male *A. subinsularis*, Strand, from Bangalore, it differs thus: labrum considerably larger; flagellum, except basally, ferruginous beneath; those parts of abdomen which appear shining black in *subinsularis* are covered with fine red hair, so that the banding is not conspicuous; hair on inner side of hind tibiæ not black, but black hair along front margin. The tongue is excessively long, when extended reaching probably 17 mm. beyond the head; labial palpi very long, but the last two joints, extending laterally, excessively minute, hardly 130 microns each; maxillary palpi with first joint short and stout; second very long, curved, finely ciliate on concave side, and with long bristles on the convex; remaining joints successively shorter, together much shorter than second, the sixth excessively minute.

♀.—Length about 16 mm.

Robust, with red hair; clypeus with a yellow keel down the middle. Nearly the same as *A. fulvohirta*, Meade-Waldo, but upper portion of lateral face-marks much larger; form not so robust; hair on inner side of hind tibiæ and tarsi mainly dark reddish, not black, that on outer side of hind basitarsi all red; fifth abdominal segment with red hair, or a small black patch subapically (the black absent in the one from Siam).

Type ♂.—Pahang, F.M.S., Kuala Lipis, May 29 (*Pendlebury*). Also ♂, Pahang, 550 ft., Dec. 8 (*Pendlebury*). Females, Pahang, 300 ft., Nov. 28 (*Pendlebury*), and Peninsular Siam, Nakon Sri Tamarat, Khao Luang, 2000 ft., March 26 (*Pendlebury*).

This insect caused me some perplexity. A female from Singapore (*Baker*), which I have had for years marked "*A. insularis*, Sm. (variety?)," is evidently *A. fulvohirta*, Meade-Waldo, the type of which came from Singapore. Smith's type, *A. insularis*, came from Sarawak, and is in the Oxford Museum. Meade-Waldo had *A. fulvohirta* also from Borneo. My present impression is that *A. fulvohirta* is the real *insularis*, Meade-Waldo having been misled by the Indian *A. subinsularis* standing as *A. insularis* in the British Museum. Perhaps all these insects are to be regarded as races of one species, but I have considered *A. subinsularis* to be distinct, in some ways more like *A. vigilans*, Sm.

Protanthidium pendleburyi, sp. n.

♀.—Length about 11 mm.

Robust, black, the light tegumentary markings confined to abdomen, consisting of dull yellow subapical bands, none on first segment, on second a very slender broken one (varying to a pair of sublateral small spots), on third to fifth an entire band attenuate laterally, on apical segment a large transverse spot; hair of head and thorax above long and black; of face mostly dark, but a white tuft laterad of each antenna, of cheeks dull white; some white at sides of prothorax, but hair on mesopleura black; long white hairs at sides of metathorax below; antennæ black; clypeus densely rugoso-punctate; head and thorax above glistening, densely punctured, a little shining space dorso-laterad of each lateral ocellus; disc of scutellum with punctures more separated; scutellum obtuse, emarginate; tegulæ black, densely punctured. Legs robust, with black hair, tarsi with red hair on inner side; spurs black; pulvilli well developed. Wings dusky hyaline, with a fuliginous cloud in apical part of marginal cell; second recurrent nervure going a little beyond outer intercubitus; abdomen shining, finely punctured; scopa orange.

Pahang, F.M.S., Cameron's Highlands, Rhododendron Hill, 5200 ft., June 21 (*Pendlebury*). Three specimens, taken in 1923.

Mr. Pendlebury has written: "*Anthidium* sp., probably new, nearest to *A. steloides*, = *longicorne*, Friese." It is closely related to *Protanthidium steloides* (Bingham), differing by the shorter, densely punctured vertex, the much more finely punctured mesothorax and scutellum, and the markings of the abdomen and legs.

Dianthidium selangorense, sp. n.

♀.—Length about 9 mm.

Broad and robust; entirely black except cream-coloured markings as follows: large quadrate patch at each side of clypeus, a corner pointing mesad, small elongate marks close to orbits, the upper end about level with top of clypeus, large spot on mandibles, and nearly all of apical abdominal tergite, this segment being black only at extreme sides, and a little mark in middle at base. Pulvilli well developed; second recurrent going far beyond second cubital cell; stigma considerably larger than in the species of *Protanthidium.* Clypeus shining, finely punctured, with a small median apical tubercle; upper edge of clypeus polished and impunctate; mandibles broad, with the margin crenulate rather than dentate; mesothorax and scutellum dull and finely rugoso-punctate; scutellum obtuse, sulcate in middle; hair of head and thorax very scanty, black dorsally, lower part of cheeks and mesopleura with white hair; antennæ black, flagellum obscurely reddish beneath; tegulæ black. Wings hyaline, stained with orange, the apex dusky; stigma ferruginous; outer nervures red, more basal ones black. Legs with black hair; spurs dark reddish; abdomen highly polished, finely punctured.

Two females; Malay Peninsula, Selangor, Bukit Kutu, 3500 ft., April 18, 1926 (*Pendlebury*).

A peculiar little species, with red ventral scopa and cream-coloured caudal end of abdomen. It appears to be closely related to *Anthidium bimaculatum*, Friese, from Taiping Hills, Malacca, but that has the scopa dark at end, and the abdomen with only a pair of small whitish marks, which are on fifth segment. I cannot tell from the description whether *A. bimaculatum* is a *Dianthidium*, but this is probably the case.

MAGACHILE.

The immediate group of *M. dimidiata*, Smith, with fulvous pubescence on head, thorax, and part of abdomen, clypeus strongly keeled, and legs bright red, is becoming complicated by the addition of closely-related but apparently distinct species, of which three new ones are now before me. The following key will separate the various forms:—

Abdominal segments 1 and 2 red-haired, or red may be poorly developed or lacking on 2; length 13-14 mm.; scopa fulvous in middle and black at sides. (India.)	*dimidiata*, Smith.
Base and sides of first segment with fulvous hair, also apical fringe on 1 and 2; ventral scopa all black; length 14-15 mm. (Singapore.)	*erythropoda*, Cameron.
Segments 1 and 2 fulvous-haired; scopa fulvous on 1 and 2 and basal middle of 3, otherwise black; hind basitarsus half as broad as tibia (one and a half in *amputata*); length 15-16 mm. (Siam.)	*ferruginea*, Friese.
Segments 1-3 red-haired, the rest black; scopa similarly coloured; length about 16 mm...	*panamera*, sp. n.

Abdomen red at base, and segments 3 to 5 with red bands; length 15–17 mm.; scopa bicoloured, black on last three segments. (Sarawak.)	*amputata*, Smith.
Abdomen with first three segments and basal half of fourth; length 16 mm.; eyes red; apical region of wings very broadly dusky. (Sumatra.)	*harrisoni*, Cockerell.
Abdomen with first three segments and apical band on fourth red; length 13·5 mm.....	*pahangiella*, sp. n.
Abdomen with first four segments and base of fifth red-haired; length about 16 mm. ..	*gombacensis*, sp. n.

The closely-related *M. velutina*, Smith, and *M. abbottiana* (Ckll.) have black legs.

Megachile panamera, sp. n.

♀.—Length about 16 mm.

Black, the legs, except coxæ, trochanters, and hind tarsi, bright ferruginous; antennæ black, the flagellum obscurely red beneath; tegulæ red, finely punctured. Wings strongly suffused with orange, apico-costal region obscurely dusky, nervures red; hair of head, thorax, first three abdominal segments (above and below), and legs bright red; rest of abdomen (above and below) entirely black; hind basitarsi parallel-sided, not nearly so broad as tibia. The clypeus is coarsely punctured and sharply keeled, but the keel does not reach the lower margin. The mandibles have two teeth and a long inner cutting-edge. Eyes brown.

Peninsular Siam, Nakon-Sri Tamarat, Khao Ram, 750 ft., March 2, 1922 (*Pendlebury*).

Megachile pahangiella, sp. n.

♀.—Length 13·5 mm., narrower than the last (width of abdomen 5 mm.).

Similar in general aspect and coloration, but first three segments and broad apical band on fourth red, but the scopa beyond the third segment black. Wings considerably more dusky in apical region; punctures of clypeus much less distinct, the general effect that of rugosity; clypeus conspicuously shorter, the angle made by clypeus and eye larger; venation of hind wings more delicate. The first ventral abdominal segment has a prominent outstanding tubercle. Eyes black.

Pahang, F.M.S., Kuala Lipis, May 29, 1926 (*Pendlebury*).

Megachile gombacensis, sp. n.

♀.—Length about 16 mm.

Similar in stature and appearance to *M. panamera*, but first four abdominal segments, and base of fifth, with deep red hair; scopa black on last two segments, otherwise red; eyes pure black; clypeus not quite so high; face distinctly narrower; apical tooth of mandibles longer; hind tarsi red like the others; sides of posterior face of metathorax with white hair. The hair of head and thorax is yellowish, contrasting with the deep ferruginous of the abdomen. The wings are orange-tinted, not nearly so dusky as in *M. pahangiella*.

Selangor, F.M.S., Gombak Valley, light, Oct. 18, 1921 (*Pendlebury*).

I infer from the label that it was taken at light, but the ocelli are not enlarged.

Megachile amputata, Smith.

I noted in British Museum:—*M. amputata* resembles *M. lanata*, Fb., a good deal, but is easily separated by concave apex of clypeus and dark red legs. Specimens of this and *M. dimidiata*, Sm., at Oxford, are labelled Mouhot. *M. rufescens* (*M. amputata rufescens*, Friese) from Sumatra appears to be a distinct species, having the abdomen above all red-haired, except scattered black hairs on fifth segment. I do not consider the name preoccupied, as the *M. rufescens* (Pérez), Frieze, is a *Chalicodoma*, and was so described by Pérez.

The following three species have the appearance of the *M. ampuata* group, but the clypeus is not keeled:—

Legs red; hind basitarsus very broad, with bright red hair along hind edge. (Cochin China.)	*saigonensis*, Cockerell.
Legs black	1.
1. Larger (18–19 mm.); hair at sides of metathorax white	*batangensis*, sp. n.
Smaller (15–16 mm.); hair at sides of metathorax red	*rhododendri*, sp. n.

Megachile batangensis, sp. n.

♀.—Length 18–19 mm.

Robust, black, the head, thorax, legs, and first three abdominal segments with fulvous hair, apex of abdomen with black hair. Wings hyaline, suffused with orange, apical margin broadly dusky, nervures ferruginous. Mandibles broad, quadridentate, but only the apical teeth prominent; clypeus very densely and coarsely punctured, with a smooth median band, but no keel; lower margin nearly straight, not at all concave; eyes brown or reddish; antennæ black; ocelli rather large and close together, the distance between posterior ones much less than that between either and the eye; vertex rugose; hair of face and vertex bright red, cheeks beneath with long white hair; mesothorax dull, densely rugoso-punctate; thorax above with bright ferruginous hair, but beneath with yellowish-white and posteriorly with white; tegulæ red; first recurrent nervure only slightly more distant from base of second cubital cell than second from apex. Legs robust, the tarsi thick, but hind basitarsi parallel-sided, not broadened; hind tibiæ with red hair on outer side and yellowish-white on inner; spurs red; hind tarsi with bright red hair on inner side; third abdominal tergite with dark chocolate hair on middle third of hind margin; fourth with fulvous hair at base, beyond which the hair is black to end of abdomen; ventral scopa creamy white, black at sides of fourth segment and black on remaining segments.

Perak, F.M.S., Batang Padang, Jor Camp, 1800 ft., Feb.–March 1915 and March 10, 1924 (*Pendlebury*).

Megachile rhododendri, sp. n.

♀.—Length 15–16 mm.

Like the last, but considerably smaller, with the hair on thorax posteriorly red. The hair of the thorax is very rich red. On closer comparison, the following additional differences appear: eyes reddish black; clypeus with the convex disc shining between the well-separated punctures, and no distinct smooth band, lower margin arcuate; outer nervures dark; first recurrent joining second cubital cell at least twice as far from base as second from apex; hind basitarsi broadened, as broad as tibiæ; hair of first three abdominal tergites all red, and all black beyond, or the fourth segment may have a dark red fringe; the hair of underside of head and thorax is pale, but nowhere white.

Pahang, F.M.S., Cameron's Highlands, Rhododendron Hill, 5200 ft., June 19, 1923 (*Pendlebury*).

This is the type-locality; others were collected there June 21 and Oct. 13. Also from Cameron's Highlands, No. 4 Camp, 4800 ft., Aug. 20 (*Pendlebury*), and three from Lubok Tamang, 3500 ft., June 23 and 24 (*Pendlebury*). The first cubital cell is not longer than the second, as it is in *Chalicodoma*.

The following species of *Megachile* from the Malay Peninsula are much smaller, and not at all like the above:—

Females; ventral scopa red, sometimes white at base .... 1.
Males .... 3.

1. Abdomen with broad bands of deep red tomentum	*ramdara*, sp. n.
Abdomen with narrow bands of orange hair	*aureocincta*, sp. n.
Abdomen without red or orange bands	2.
2. Mesothorax coarsely sculptured, scopa practically all red	*kualana*, sp. n.
Mosothorax finely sculptured, scopa broadly white at base	*subrixator*, Ckll.
3. Thorax above with bright red hair	*cæcina*, Cam.
Thorax without such hair	4.
4. Larger, fully 10 mm. long; abdomen with red hair-bands	*aureocincta*, sp. n.
Smaller, abdomen with bands at most slightly ochreous-tinted	*subrixator*, Ckll.

Megachile ramdara, sp. n.

♀.—Length about 9 mm.

Rather slender and parallel-sided, black with bright red ventral scopa, whitish only at extreme base; head and thorax dull, strongly and excessively densely punctured; face and cheeks with thin short white hair, more conspicuous at sides of face; vertex almost without hair; mandibles black; clypeus rugose, lower margin gently concave; in a certain position a very faint raised line can be seen from front to apex of clypeus, but it cannot be called a keel; antennæ entirely black; thorax with very little hair, dorsum practically bare (perhaps more hairy when fresh), tubercles with a white fringe; white hair at sides of metathorax; tegulæ dull black. Wings fuliginous, shining violaceous; second cubital cell long, receiving recurrent nervures about equally distant from base and apex. Legs black, with very thin pale hair, red on inner side of tarsi; spurs very pale yellowish; claws with a sharp basal tooth; abdomen parallel-sided, finely punctured, with bands of deep red tomentum on segments 2 to 5, broadened at sides on 2 to 4, very broad on 5 throughout, also red patches at sides of first segment and thin red hair on sixth; hind margin of first segment with tegument dark reddish. The coloration of the abdomen, with alternating dark red and black bands, is peculiar. The red is deeper, less orange, than that on the abdomen of *M. candentula*, Ckll. In the table of Philippine Is. species, this runs out in the vicinity of *M. rufofulva*, Ckll., but is very distinct, and I find no close ally anywhere.

Perak, F.M.S., Batang Padang, Jor Camp, 1800 ft., May 27, 1923 (*Pendlebury*).

Megachile cæcina, Cameron.

♂.—Selangor, F.M.S., Kuala Lumpur, Aug. 2, 19 (*Pendlebury*).

The type came from Sarawak, but this seems to be quite the same.

Megachile subrixator, Cockerell.

♀.—Kuala Lumpur, Aug. 19 (*Pendlebury*); Singapore, Thomson Road, June 22 (*C. Boden Kloss*). ♂.—Kuala Lumpur, April 4 and 5 (*Pendlebury*). Described from the Philippine Is., but previously recorded from Singapore.

Closely related to *M. hera*, Bingham *.

Megachile aureocincta, sp. n.

♀ (type).—Length 10 mm.

Black, robust, with heart-shaped abdomen; head broad; eyes brown; mandibles and antennæ entirely black; mandibles quadridentate; clypeus shining, sparsely punctured, rather bulging at upper end, but flattened or depressed in middle, the lower margin practically straight; vertex with dense fine punctures, producing a roughened effect; hair of face pale ochreous, more or less mixed with black, of vertex black, of cheeks white; mesothorax extremely densely punctured, but glistening; scutellum convex, dull, rugosopunctate; thorax with pale ochreous hair anteriorly, about tubercles, and in scutello-mesothoracic suture; scutellum and disc of mesothorax with black hair, very long on scutellum; metathorax with light hair, but mesopleura with black; tegulæ small, shining black. Wings brownish hyaline, apical margin darker; nervures black; first recurrent ending nearly twice as far from base of second cubital cell as second from apex. Legs with some pale hair at base, otherwise mostly black, but deep red on inner side of tarsi; spurs red; hind basitarsi much broadened, the posterior fringe black; abdomen densely and minutely punctured; segments 2 to 5 with narrow entire very conspicuous orange hair-bands; venter ferruginous, with the scopa golden in middle and black at sides.

Resembles *M. tricincta*, Bingham, from Tenasserim, but has four golden bands, scopa black at sides, and other differences.

♂.—Parallel-sided, but rather robust; mandibles tridentate; clypeus convex, the disc shining and sparsely punctured; lower part of clypeus bearded with long white

---

* Bingham descibes *M. hera* as having ventral scopa white at base, fulvous on four apical segments, and I have found it so. But at Oxford I found a specimen determined by Meade-Waldo as *M. hera*, with scopa pale red, black on last segment. This is evidently distinct.

hair, and long dense pure white hair between antennæ; cheeks with long white hair; antennæ long, entirely black; vertex dull in middle, shining at sides; hair of thorax much as in female, but on under side long and pure white; anterior tarsi simple; anterior coxæ unarmed; abdomen with five orange bands, apical on segments 1 to 3, and basal on 3 and 4, while the fifth segment is covered with orange hair; sixth with a double curve in lateral profile, its transverse keel well notched in middle; vertex black, with white hair-bands. In Friese's table this runs to *M. implicator*, Cameron, but it is not the same. I saw the type of *M. implicator* in the Rothney collection; the mandibles (male) have four sharp teeth. The insect agrees with that now described in the sixth abdominal segment with deep notch, long antennæ, absence of spines on anterior coxæ; but there are conspicuous differences in the pubescence.

Type-locality (♀).—Pahang, F.M.S., Cameron's Highlands, No. 4 Camp, 4800 ft., Oct. 18, 1923 (*Pendlebury*). The male is from Peninsular Siam, Nakon Sri Tamarat, Khao Ram, 750–1200 ft., Feb. 23, 1922 (*Pendlebury*).

It is very possible that the male represents a distinct though closely-allied species, but for the present it seems best placed under *M. aureocincta*.

Megachile kualana, sp. n.

♀.—Length about 8·5 mm.

Black, robust, with short abdomen; ventral scopa coppery red, not very bright, from apex to base; hair of head and thorax very scanty, white at sides of face, thin and black on vertex, front and middle of face; extremely short and scanty, black, on thorax above; thin and white on under side of thorax; mandibles and antennæ black; clypeus convex, finely and densely rugoso-punctate, its lower edge irregularly denticulate or crenulate; supraclypeal area and front dull and excessively densely rugosely punctured; mesothorax and scutellum similarly, quite coarsely punctured; tegulæ black. Wings dilute fuliginous; second recurrent nervure ending almost at end of second cubital cell, first some distance from base. Legs with a little pale hair; hind basitarsi not broadened; spurs red; claws with two subbasal bristles but no inner tooth; abdomen shining, finely punctured, segments 1 to 5 with narrow pure white hair-bands at sides only.

Kuala Lumpur, F.M.S., Gombak Valley, April 6, 1924 (*Pendlebury*).

A peculiar little species, which runs out in all tables. In Bingham's table it seems to run near "*M. chlorigaster*, Cam.," of which it is said that the type is in coll. Rothney. This is evidently intended for *M. chrysogaster*, Cameron, 1897, which I found in the Rothney collection, and noted: small species, length nearly 7 mm.; it is a small black *Osmia*; pulvilli present; at base of metathorax a transverse sulcus bounded by a sharp keel, the sulcus is crossed by little ridges. It will stand as *Osmia chrysogaster* (Cam.), though the name is inappropriate. Another species which runs to this vicinity in tables is *M. bombayensis*, Cam., easily separated by the clear wings, character of face, &c. *M. bombayensis* is placed in the British Museum as a synonym of *M. hera*.

Cœlioxys kualana, sp. n.

♂.—Length 6 mm.

Black, including mandibles, legs, antennæ, and tegulæ; eyes grey-green, with very short hair; face and front densely covered with pale yellow hair; vertex coarsely punctured; cheeks densely covered with white hair, the lower part with a groove; mesothorax and scutellum coarsely and extremely densely punctured; no hair-spots or bands between mesothorax and scutellum, but mesothorax with pale hair on its anterior middle; margin of scutellum entire, axillar spines short; a broad band of pure white tomentum down each side of thorax below wings. Wings dusky hyaline, nervures dark. Legs densely clothed with white hair. Abdomen shining, sparsely punctured, more strongly and closely on first segment; hair-markings of abdomen pure white, a slender apical band and large lateral patches on first segment, very broadly interrupted bands on the others; apical segment with eight spines, a latero-basal pair, four upper and two lower apical, the latter twice as long as the upper.

Kuala Lumpur, F.M.S., Aug. 2, 1926 (*Pendlebury*).

Doubtless parasitic on *Megachile kualana* or one of the other small species of *Megachile*. Superficially, it looks just like *C. dapitanensis*, Ckll., from the Philippines, but it is easily separated by the dark tegulæ, absence of spots between mesothorax and scutellum, and second cubital cell much more produced apically, the second recurrent ending far from its apex. The lower apical spines are not quite so long as in *C. dapitanensis*. In the Indian fauna it falls with *C. capitatus*, Smith, but differs in the ornaments of the thorax. *C. capitatus* typically has red legs.

Trigona apicalis peninsularis, subsp. n.

Worker.—Clypeus and supraclypeal area yellow, but sides of face black; antennæ entirely red above and below; mandibles black, dark red apically; prothorax red; scutellum black at base and red apically; mesothorax, mesopleura, and metathorax shining pure black; legs red; abdomen entirely clear orange-ferruginous. The cheeks are black, varying to largely red. Although this insect looks very distinct, it appears to differ only in colour from *T. apicalis*, Smith, from Borneo.

Type from Perak, F.M.S., Batang Padang, Jor Camp, 1800 ft., June 4, 1923 (*Pendlebury*). Also from Peninsular Siam, Patalung, May 3 (*I. H. N. Evans*). Specimens with dark red abdomen come from Patalung (*Evans*) and Kuala Lumpur, Gombak Valley, Oct. 13 (*Pendlebury*). The last-mentioned has the prothorax black, except the tubercles.

Bingham long ago remarked on the variability of this species.

Trigona atripes, Smith.

Selangor, Pahang, near Genting, Sempat Hill Stream, Sept. 11 (*C. Dover*). The type-locality is Mt. Ophir.

Trigona itama, Cockerell.

Same locality, date and collector as the last.

LXX.—"*Synonymic Notes on* Jassoidea *and* Membracidæ."

By F. W. GODING.

IN the 'Annals and Magazine of Natural History' for June 1927, under the above caption Mr. W. E. China states that "the following genera and species by Dr. Goding in the family Membracidæ must be transferred to the super-family Jassoidea, family Cicadellidæ, tribe Ciccini" in *re* the genera *Williamsiana* and *Eustollia* and their species, with no proof other than the above dictum.

In reply, I desire to present the following observations:—

Mr. W. L. Distant, than whom no more accurate or accomplished homopterist ever worked on the group, characterized the Membracidæ as follows:—"Ocelli placed between the eyes; antennæ inserted in front of and between the eyes; pronotum prolonged backward into a hood or process of variable form" (Fauna Brit. Ind. iv. p. 1)—all of the species under consideration agreeing.

Tropidaspis cornuta, Hav., fits into *Eustollia* as well as do some other species fit into other described groups, but does not agree with the examples of *Tropidaspis* before me, as also is true of *Tolania punctata*, M. & B., which is certainly not a *Tolania*.

In discussing "The Types of certain Genera of Membracidæ" in 'Entomological News,' xxxviii. p. 14 *et seq.*, Dr. Metcalf intimates that where the type-species of a genus proves to belong to a previously described genus, the next-mentioned species of the genus is to be considered the genotype, a position usually accepted. I believe it to be best to consider the three species listed under *Eustollia* as included in that genus; but if, with abundant material, a comparison is made and *jubata* is shown to belong elsewhere, *punctata*, M. & B., should be admitted to be the genotype.

Following a suggestion made by Mr. China, I re-examined *Eufroggattia tuberculata*, genotype (Mon. Memb. Australia, pp. 37–38), under better apparatus, with the result that I am satisfied it is an Heteropteron.

In my opinion Stoll's great works have been ignored without sufficient reason. His descriptions and figures are at least equal to those of other writers of his time, all of which have been identified, but the credit given to later students. That his names are in Dutch and French with no Latin equivalent does not prevent others from supplying them, if desired; but what about names taken from the Hebrew, Arabic, and several aboriginal dialects? His work was performed as well as that of others of even date, for which he should be given full credit, as has been done in my later papers, and it must be admitted that his books have added much to our knowledge of descriptive entomology.

In conclusion, I desire to state that criticism of my work is fully appreciated and desired; but, again quoting my revered friend, Mr. Distant:—

"The provisional view held here . . . is the position selected by Stål . . . Some caution is, however, necessary in making this choice, . . . some writers . . . have chosen . . . to severely critise any departure from what, according to their view, should be compulsory classification. From this ruling we entirely dissent, and regard final classificatory schemes as yet unattained. Our object is to render the Indian Rhynchota recognizable, not for pedantic division, but for the more important object of bionomical economic observation" (*l. c.* p. 77).

LXXI.—Neusticurus dejongi, *sp. n., a new Lizard from Surinam.* By L. D. BRONGERSMA, Zoological Laboratory, University, Amsterdam.

WHEN identifying reptiles from Surinam in the Amsterdam Museum I found a *Neusticurus* species which I believe to be new. I have named it after Dr. J. K. de Jong, the eminent herpetologist of the Zoological Museum.

Type: ♂, Surinam, 1890; *Bruegel* leg., *M. Weber* don.

The eye-opening is once and a half the diameter of the ear. The transparent disk is composed of three pieces. The portion of the rostral which is visible from above is nearly half as long as the frontonasals. Frontonasalia two, each somewhat more than twice as long as broad. Two prefrontals. Frontal behind with a median groove. A pair of frontoparietals. A small shield between the frontoparietals and the interparietal, about lozenge-shaped. The interparietal is large and has a smaller parietal on each side. A small shield behind each parietal, followed by a larger one which is nearly separated from the interparietal by a granule on one side and completely on the other side. A median occipital behind the interparietal. Four supraoculars; the first is smallest and is separated from the second by three small granules. On the right side the last supraocular is divided into two shields. Some small granules between the supraoculars and the supraciliaries. Nostril in a single nasal, which is in contact with the upper labials. The loreal is separated from the upper labials by two granules. Eight upper labials and four lower. Between the eye and the upper labials is a series of suborbitalia. Four pairs of chin-shields; the first two pairs in contact, the third and fourth pairs separated by scales. Gular scales largest on the sides. Behind the sulcus gularis the scales are small, with a conical keel, becoming larger, more flattened, and with an obtuse keel towards the collar-fold. Eight collar-plates, a little larger than the scales in front, obtusely keeled. The scales on the temple are small; those of the upper rows and in front of the ear larger, those of the lower rows more elongate; a large scale in the middle. Back with small scales intermixed with larger keeled ones. Behind the occiput the keeled scales are placed irregularly; on the back of the neck they form regular longitudinal rows (four of large ones, rows of smaller tubercles on the sides). These rows become irregular on the back, some of the scales touching the vertebral line. On the tail two rows of keeled scales form a double crest, the scales of each row are separated by one or two smaller scales. Other keeled scales on the sides. The ventral surface of the body is covered by smooth plates in eight longitudinal and twenty-three transverse rows, those of the two median rows in front about as broad as long, behind longer than broad; the rows next to the median ones are formed of plates which are broader than long anteriorly and as broad as long posteriorly; the plates of the outer rows are keeled obtusely. Four præanal plates; one large plate medio-anteriorly, two large ones latero-posteriorly separated by a smaller medio-posterior plate; the last three bordering the anal cleft. Seventeen femoral pores on each side. Tail below with four rows of enlarged plates which are longer than broad, those of the outer rows obtusely keeled. The sides of body and tail are divided into segments by vertical folds.

Light brown above, with spots of darker brown arranged quincuncially; along the sides of back and tail a series of light spots; body whitish below; lower surface of tail brown with some whitish spots.

	mm.
Total length	138
Length of head	14
Width of head	8
From end of snout to fore limb	22
" " " vent	51
Fore limb	20
Hind limb	29
Tail	89

The above-described species differs:—

From *N. bicarinatus* (L.) (*Lacerta bicarinata*, Linn. S. N. i. p. 361; *Neusticurus bicarinatus*, Boulenger, Cat. Liz. ii. 1885, p. 381) by the azygous shield between the frontonasalia and præfrontalia being absent, by the regular occipital shields, by having two anterior chin-shields, and by the lower number of femoral pores.

From *N. ecpleopus*, Cope (Cope, Journ. Ac. Philad. (2) viii. 1876, p. 161; Boulenger, Cat. Liz. ii. 1885, p. 382), by the divided transparent disk, the higher number of upper labials, the granules between the loreal and upper labials, the irregularity of the keeled scales on the back.

From *N. rudis*, Boulenger (Boulenger, Trans. Linn. Soc. Lond., Zool. (2) viii. pt. 2, Sept. 1900, p. 53), by the smaller ear-opening, the transparent disk being composed of three pieces, the interparietal with a parietal on each side (five shields in a row by *N. rudis*), the regular occipitals, the two anterior chin-shields, and the number of collar-plates.

From *N. surinamensis*, Müller (Müller, Zool. Anz. Bd. lviii. Heft 9–10, 20th Feb., 1924, p. 295), by the smaller ear, by the azygous shield between frontonasalia and præfrontalia being absent, by the regular occipital shields, the two anterior chin-shields, the lower number of collar-shields, and by the irregularity of the keeled scales on the back.

The following key may serve to distinguish the species:—

I. An azygous shield between the frontonasalia and præfrontalia.	
A. Frontal with a median groove; diameter of the ear half that of the eye-opening	*N. bicarinatus.*
B. Frontal without median groove; diameter of ear three-fourths that of the eye-opening	*N. surinamensis.*
II. No azygous shield between the frontonasalia and præfrontalia.	
A. Transparent disk undivided; dorsal keeled scales in regular longitudinal rows	*N. ecpleopus.*
B. Transparent disk divided; keeled scales on back disposed more or less irregularly.	
1. One anterior chin-shield	*N. rudis.*
2. Two anterior chin-shields	*N. dejongi.*

LXXII.—*Notes on Fossorial Hymenoptera.*—XLII.

By Rowland E. Turner, F.Z.S., F.E.S.

Family Scoliidæ.

Braunsomeria albohirta, sp. n.

♀. Rufo-ferruginea; albo-hirta; abdomine nigro, segmento apicali rufo-ferrugineo; femoribus tibiisque fuscis, tarsis luteis.

Long. 9 mm.

♀. Mandibles bidentate, the outer tooth much longer than the inner; the mandibles without teeth on the inner margin. Head broader than long by about one-seventh, broader than the pronotum, subrectangular, smooth and shining, with a few large punctures between the base of the antennæ and the eyes. Ocelli very small, situated in an equilateral triangle, the posterior pair nearly three times as far from the hind margin of the head as from each other; eyes oblique, separated from the hind margin of the head by a distance about equal to their own length, but touching the base of the mandibles. Scape clothed with long pale hairs on the margins, as long as the two basal joints of the flagellum combined plus half of the third joint; the antennæ apparently eleven-jointed, doubtless due, as in many of the smaller Scoliids, to the small basal joint being concealed in the apex of the scape. Pronotum as long as its anterior breadth, distinctly broader posteriorly; with a few large piliferous punctures; mesonotum obsolete, scutellum short, less than one-third of the length of the pronotum; median segment shorter by one-quarter than the pronotum, smooth anteriorly, posteriorly with large, sparse, piliferous punctures, distinctly broader at the apex than long. Abdomen shining; tergites 2–5 depressed on each side of the apical margin, leaving a curved raised line before the apex, the edge of which is marked by a row of long white hairs. Intermediate and hind tibiæ with a row of strong spines, the longest spur of the hind tibia more than two-thirds of the length of the hind metatarsus; tarsal ungues simple.

Hab. Bulawayo; October and November (*G. Arnold*).

Described from three specimens.

Near *B. quadraticeps*, Turn., but differs in the broader head, the absence of teeth on the inner margin of the mandibles, in the colour of the abdomen, and in the strong punctures of the pronotum.

This is probably the female of *B. cognata*, Turn., which occurs in the same locality and mouth.

Anthobosca arnoldi, sp. n.

♀. Nigra, albido-pilosa; antennis, macula basali flava, prothorace, mesonoto, scutelloque rufo-ferrugineis; orbitis oculorum linea angusta, externa in verticem anguste continua, postscutello linea transversa, tergito primo fascia subapicali angustissime interrupta, secundo tertioque macula laterali utrinque, quarto fascia interrupta, femoribus macula apicali, tibiis anticis supra, tarsis intermediis posticisque articulis apice articuloque apicali nigris, albido-flavis; alis fusco-hyalinis, venis fuscis.

Long. 10–13 mm.

♂. Niger, sparse albido-pilosus; mandibulis, apice excepto, clypeo, apice nigro bidentato, orbitis oculorum, supra nigro interruptis, pronoto fascia postica in medio angustissime interrupta, tegulis, mesonoto macula, scutello fascia curvata postice, postscutello linea transversa, mesopleuris linea obliqua, segmento mediano maculis tribus apicalibus, tergitis 1–6 fascia mediana anguste interrupta, tergito septimo fascia basali, femoribus apice, tibiis supra, tarsisque, articulis apice fuscis, pallide flavis; alis hyalinis, leviter infumatis, venis fuscis.

Long. 8–13 mm.

Var. ♀. Thorace omnino nigro, tergitisque primo quartoque fasciis flavis subobsoletis.

Var. ♂. Mesonoto, scutello segmentoque mediano immaculatis.

♀. Scape very finely punctured, the second joint of the flagellum a little longer than the third, the latter nearly as broad at the apex as long. Clypeus short and broad, subtruncate at the apex. Head very closely and distinctly punctured, with rather long whitish hairs on the front. Thorax very closely and rather strongly punctured above, propleuræ almost smooth, mesopleuræ very finely punctured; median segment opaque, very closely and microscopically punctured. Abdomen shining, microscopically punctured, the tergites more sparsely punctured apically. Sixth tergite broadly rounded at the apex, subopaque, with large sparse punctures, and clothed with fulvous hairs near the apex. Torsal ungues bifid, the inner claw short. Radial cell broadly rounded at the apex; second abscissa of the radius shorter than the first, the third as long as the second and third combined. But the neuration is subject to considerable variation in these details.

♂. Head and thorax very closely and rather finely punctured, clothed with short whitish hairs; clypeus slightly convex, distinctly bidentate at the apex. Antennæ short, scarcely half as long as the costa of the fore wing, the second joint of the flagellum distinctly shorter than the third. First tergite short, very much broader at the apex than long. Abdomen minutely and very closely punctured, most minutely at the base of the segments. Legs clothed with very delicate white pubescence, hind tibiæ serrate. Second abscissa of the radius usually shorter than the first. Tarsal ungues bifid.

Hab. South Rhodesia; Bulawayo, November and December (*G. Arnold and R. H. R. Stevenson*); Helenvale (type), December (*G. Arnold*); Hillside, February (*Swinburne and Stevenson*).

The female is dimorphic as to the colour of the thorax, a similar dimorphism occurs in the allied species *A. erythronota*, Cam. As in other species of the genus, the yellow markings of the male vary much in extent.

Anthobosca stevensoni, sp. n.

♀. Nigra; albo-pilosa; mandibulis, scapo, flagelli articulo basali, tegulis, femoribus apice, tibiis tarsisque ferrugineis; tergito tertio linea transversa basali utrinque alba; alis hyalinis, venis nigris; pygidio dense aureo-setoso.

Long. 9 mm.

♀. Clypeus subtruncate at the apex, with a small raised triangular space before the apex; head closely punctured, much more coarsely on the front than on the vertex. Second joint of the flagellum shorter than the third, which is scarcely as long as the fourth. Thorax closely punctured, rather strongly on the pronotum, more finely on the mesonotum and scutellum; median segment opaque, very closely microscopically punctured. Abdomen very minutely and closely punctured, with a few larger punctures interspersed on tergites 3–5; pygidium rounded at the apex and densely clothed with fulvous-gold setæ, which spring from very large punctures. The spines on the outer edge of the hind tibiæ are very large and blunt, forming five lamellar processes, with one or two smaller spines near the base, the hairs between the spines are golden. Second abscissa of the radius a little longer than the first.

Hab. South Rhodesia; Bulawayo, December; Sawmills, April (*R. H. R. Stevenson*).

The puncturation of the mesonotum and scutellum is very much finer than in *A. arnoldi*.

Family Psammocharidæ.

Calicurgus oraniensis, sp. n.

♀. Fulvo-rufa; capite, metanoto, segmento mediano mesopleurisque nigris; flagello ferrugineo, mandibulis basi fusco-ferrugineis; segmentis abdominalibus tribus apicalibus tarsisque apice infuscatis; alis hyalinis, venis fusco-ferrugineis.

Long. 7·5 mm.

♀. Head shining, microscopically punctured; posterior ocelli separated from the eyes by a distance one and three-quarter times as great as that separating them from each other; eyes diverging towards the clypeus. Second joint of the flagellum three times as long as the first, scarcely longer than the third. Clypeus microscopically punctured at the base, sparsely clothed with long fulvous hairs, with a row of large punctures below the middle, the apex very broadly rounded. Thorax smooth and shining, the pronotum shorter than the mesonotum, the posterior margin almost angulate in the middle; median segment subopaque, longitudinally impressed in the middle, the apical slope oblique, without a longitudinal impression. Abdomen smooth and shining. Hind tibiæ serrate, tarsal ungues with a median tooth, hind metatarsus as long as the four apical tarsal joints combined, longer spur of the hind tibia half as long as the hind metatarsus, the two apical tarsal joints without spines beneath. Third abscissa of the radius a little longer than the second, cubitus of the hind wing originating beyond the transverse median nervure.

Hab. Harrismith, Orange Free State; February and March 1927 (*Turner*).

Described from two specimens.

The South African species of *Calicurgus* known to me may be separated as follows:—

1.	Fulvus red and black; wings hyaline....	*C. oraniensis*, sp. n.
	Black; wings not wholly hyaline	2.
2.	Wings hyaline, with fuscous bands.. ..	*C. namabatashane*, Turn.
	Wings yellow, with fuscous margin	*C. retusus*, sp. n.

Calicurgus retusus, sp. n.

♀. Nigra; tibiis anticis subtus tarsisque, articulo apicali nigro, ochraceis; alis flavis, apice post cellulas infuscatis; venis flavis, apice extremo fuscis.

Long. 9 mm.

♀. Head subopaque, closely and minutely punctured; posterior ocelli near together, nearly three times as far from the eyes as from each other. Clypeus very closely punctured, finely at the base, more strongly towards the apex, with a very small smooth depression in the middle of the subtruncate apical margin. Second joint of the flagellum four times as long as the first, but very little longer than the third. Pronotum shorter than the mesonotum, the hind margin arched, the thorax shining, with minute punctures. Median segment coriaceous, with a median longitudinal groove on the dorsal surface, the oblique posterior slope without a groove. Abdomen smooth and shining. Hind tibiæ strongly serrate, tarsal ungues with one tooth a little beyond the middle. Hind metatarsus as long as the second, third, and fourth joints of the hind tarsus combined, longer spur of the hind tibia a little less than half as long as the metatarsus. Second abscissa of the radius distinctly longer than the third; cubitus of the hind wing originating considerably beyond the transverse median nervure.

Hab. Van Reenen's Pass, Drakensberg, Natal; January (*Turner*).

Described from a single specimen.

Cryptosalius spinosipes, sp. n.

♀. Nigra; thorace segmentoque mediano rufo-ferrugineis, rugosis; tergitis secundo tertio quartoque macula basali argenteo-pubescente utrinque; alis sordide hyalinis, anticis fusco bifasciatis.

Long. 12 mm.

♀. Head coriaceous, the front with sparse punctures and a shallow groove from the antennæ reaching halfway to the anterior ocellus; clypeus finely punctured, clothed with greyish hairs and transverse at the apex. Antennæ stout and short, second joint of the flagellum half as long again as the scape, the latter slightly shorter than the third joint, but nearly twice as long as the first. Ocelli in a wide triangle, the posterior pair nearly as far from each other as from the eyes. Thorax and median segment rugose, most coarsely on the dorsal surface of the median segment, where the sculpture tends to irregular transverse striæ; coarsely on the pronotum and much more finely on the mesonotum; on the pleuræ the sculpture is a little finer than on the pronotum, the sternum is coriaceous with large sparse punctures; the lower part of the pleuræ and the sternum covered with extremely delicate changeable pubescence, which in some lights makes them appear black; on the scutellum and postscutellum the sculpture tends to irregular longitudinal striæ; there are also a few longitudinal striæ at the base of the median segment, which is subquadrate, rather abruptly truncate posteriorly, the surface of the truncation transversely striate-rugose and with a dense apical band of silver hairs. Abdomen slightly shining, tergites 2–4 with lateral basal patches of silvery pubescence; the impressed transverse line on the second sternite well defined. Intermediate and hind tibiæ and tarsi with many slender spines, tarsal ungues with one small tooth. Second abscissa of the radius half as long again as the third; cubitus of the hind wing interstitial.

Hab. Harrismith, Orange Free State, early in February 1927 (*Turner*).

Described from two females.

This differs from the other members of the genus in the spinose hind legs, but agrees in the general build, and with the other Ethiopian species of the genus in the coarse sculpture of the median segment.

The sting of this species is particularly severe.

Genus EIDOLOPOMPILUS, Kohl.

Eidolopompilus, Kohl, Ann. Naturhist. Hofmus. Wien, xiv. p. 305 (1899).

Jansea, Cam. Annals Transvaal Mus. ii. p. 129 (1910).

Dr. Brauns has pointed out this synonomy.

Eidolopompilus tenellus, Turn.

Aporus tenellus, Turn. Proc. Zool. Soc. London, p. 336 (1910). ♀.

Described from N. Queensland, but I subsequently took a male at Perth, W. Australia.

The radial cell is a little larger than in S. African species of the genus. The second recurrent nervure is also present, though not as strongly marked as the other nervures, and the submedian cell in hind wing is much longer, extending to the origin of the cubital nervure. Though not developed in the typical species, *E. braunsi*, the second recurrent nervure is present in the other S. African species, in which, however, it is received well before the second transverse cubital nervure, not interstitial with it as in *tenellus*. The first transverse cubital in African species is interstitial with the first transverse cubital nervure, but in *tenellus* it is received at one-third from the base of the second cubital cell. These differences seem scarcely of generic importance.

Key to the South African Species of Eidolopompilus.

1.	Fore wing with white apical patch	2.
	Fore wing wholly fuscous	*E. longitarsis*, Cam.
2.	Second recurrent nervure missing, wings very short	*E. braunsi*, Kohl.
	Second recurrent nervure present, wings longer.	*E. apicipennis*, sp. n.

Eidolopompilus braunsi, Kohl.

Eidolopompilus braunsi, Kohl, Ann. Naturhist. Hofmus. Wien, xiv. p. 306 (1899).

A pair in the British Museum from Algoa Bay, received from Dr. Brauns.

Eidolopompilus longitarsis, Cam.

Jansea longitarsis, Cameron, Ann. Transvaal Mus. ii. p. 129 (1910).
Eidolopompilus longitarsis (Cam.), Brauns, Ann. Transvaal Mus. v. p. 243 (1917).

I have taken this species at Van Reenan's Pass, Natal; Queenstown, Aliwal North and Mossel Bay, Cape Province. The length of the wings seems to vary considerably, also the position of the nervulus, which is sometimes quite strongly postfurcal. The second recurrent nervure is always present.

Eidolopompilus apicipennis, sp. n.

♀. Nigra, opaca; tergitis 1–3 fascia apicali interrupta cano-sericea; alis hyalinis, post cellulas infuscatis, macula apicali alba.
Long. 8–10 mm.

♀. Third joint of the flagellum as long as the scape, the second longer by one-fifth and fully four times as long as the first joint. Posterior ocelli slightly nearer to the eyes than to each other. Head, thorax, and median segment coriaceous; pronotum as long as the mesonotum and scutellum combined; median segment elongate, longer than the pronotum by two-fifths, with a longitudinal groove, twice widely interrupted, from base to apex. Armature of the legs as in *E. braunsi*, but the tooth on the tarsal ungues is more distinct. The hind metatarsus is a little longer than the second and third tarsal joints combined. Wings not very much shortened; second recurrent nervure well defined, received at three-quarters from the base of the second cubital cell; nervulus almost interstitial, very slightly postfurcal. The development of the groove on the median segment is variable.

Hab. Aliwal North, Cape Province (type), November and December 1922 (*Turner*); 2 ♀ ♀. Also from Salisbury, Rhodesia (*G. A. K. Marshall*); and Monkey Bay, Lake Nyasa (*Dr. W. A. Lamborn*).

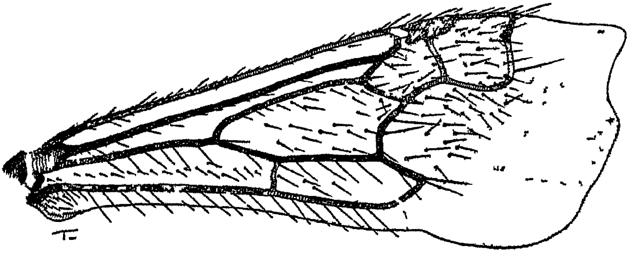
The types of the species described above are in the British Museum.

LXXIII.—*New Parasitic Hymenoptera in the British Museum.* By ROWLAND E. TURNER, F.Z.S., F.E.S.

Family Evaniidæ.

BRACHEVANIA, gen. nov.

Wings short, the apex of the fore wing only extending a little beyond the apex of the median segment and not reaching as far as the middle of the petiole, the basal two-thirds of the wing as far as the apex of the radial cell sparsely clothed with hairs. Basal nervure forming an obtuse angle at its juncture with the cubital nervure; the subcostal joining the basal nervure just before that nervure reaches the base of the stigma; radial cell short, very broadly truncate at the apex, the vertical portion of the radial vein as long as the horizontal portion. Transverse discoidal nervure received a little beyond the middle of the cubital cell; submedian cell very long, the nervulus strongly postfurcal, received at two-fifths from the base of the discoidal nervure. Cubital nervure not continued beyond the cubital cell; anal nervure obsolete. Hind wing not incised at the base and without a frenulum.



Brachevania kristenseni, sp. n. Fore wing.

Type of the genus, *B. kristenseni*, sp. n.

Brachevania kristenseni, sp. n.

♀. Nigra; tarsis fusco-ferrugineis; abdomine rufo, petiolo nigro; alis hyalinis, venis fusco-ferrugineis.
Long. 6 mm.

♀. Head very coarsely striate-reticulate, the striæ longitudinal, face and cheeks coarsely striate-reticulate; a smooth transverse line on the vertex connecting the posterior ocelli. Antennæ short and stout, scarcely as long as the head, thorax, and median segment combined; second joint of the flagellum twice as long as the first and half as long again as the third; scape finely punctured and clothed with short pale hairs, the flagellum especially on the basal joints also clothed with very delicate pubescence; a strong tubercle between the antennæ. The thorax and median segment very coarsely punctured-reticulate; the anterior margin of the pronotum straight, with a small spine at the anterior angles, a stouter spine on each side in front of the tegulæ. Metasternal process forming with the open apical space an almost equilateral triangle. Median segment very strongly concave on the posterior slope. Mesopleuræ with a large, smooth, and polished space below the tegulæ, the lower part of the mesopleuræ sparsely punctured. Petiole strongly longitudinally striate, twice as long as the scape. Legs short and stout, the hind coxæ, femora, and tibiæ closely punctured and clothed with short pale hairs, the tibiæ without spines; basal joint of the hind tarsi longer than the four apical joints combined; calcaria ferruginous, the longer spur scarcely more than one-third of the length of the basal joint of the hind tarsi.

Hab. Harar, Abyssinia (*G. Kristensen*). Type in British Museum.

The shape of the radial cell resembles the genus *Trissevania*, Kieff., but otherwise the neuration is very different.

Parevania annulicornis, sp. n.

♀. Nigra; flagelli articulis quarto quintoque albis; palpis, mandibulis apice extremo, scapo, sterno pedibusque luteis; femoribus tibiisque infumatis; petiolo fusco, apice late luteo-annulato; tegulis fusco-ferrugineis; alis hyalinis, venis fusco-ferrugineis.

♂. Feminæ similis; antennis haud albo-annulatis.

♂ var. Pronoto, mesonoto antice, scutelloque ferrugineis.

Long., ♀ 4–5 mm., ♂ 4·5–5·5 mm.

♀. Scape as long as the two basal joints of the flagellum combined; second joint of the flagellum four and a half times as long as the first and half as long again as the third. Head shining, finely and closely punctured on the front, more sparsely on the vertex and on the face, the latter almost flat and with a slightly curved groove on each side reaching from the antennæ to the mandibles; cheeks less than half as long as the eyes, the latter slightly divergent below; posterior ocelli farther from each other than from the eyes. Pronotum rounded at the posterior angles; mesonotum shining, almost smooth, the punctures microscopic; parapsidal furrows deep, convergent, but not meeting posteriorly. Scutellum convex, shining, minutely punctured. Basal portion of the median segment above rather finely rugose, the vertical portion of the segment more coarsely rugose; pleuræ and sides of the median segment coarsely punctured-reticulate; the metasternal process with short parallel branches, which do not reach the middle of the hind coxæ. Petiole twice as long as the distance separating its base from the metanotum, smooth, shining, as is the rest of the abdomen. Hind coxæ almost smooth; longer spur of the hind tibia three-quarters of the length of the metatarsus. Stigma with a white spot at the base; the distance between the basal nervure and the stigma is a little less than the length of that nervure from the angle of the discoidal cell to the subcosta.

♂. The scape is scarcely as long as the second joint of the flagellum, which is scarcely as long as the third joint.

Hab. Pondoland, Port St. Johns; September to February (*Turner*); a long series. Natal, Durban (*F. Muir*); one male.

Taken in dense forest.

Parevania sanguineiceps, sp. n.

♂. Nigra; capite sanguineo, mandibulis basi antennisque nigris, scapo subtus ferrugineo; alis hyalinis, venis fuscis; tibiis anticis fulvis, intermediis tarsisque anticis intermediisque fuscis.

Long. 4–4·5 mm.

♂. Scape scarcely longer than the second joint of the flagellum, which is nearly four times as long as the first and very slightly shorter than the third. Front and vertex rather strongly, but not closely punctured, a depressed space above the base of the antennæ reaching almost to the anterior ocellus, very finely rugulose, and with a low carina from the anterior ocellus dividing it; face shining, microscopically punctured, moderately convex, with a rather wide groove on each side from the antennæ to the mandibles; cheeks less than half as long as the eyes, posterior ocelli nearly twice as far from each other as from the eyes. Posterior angles of the pronotum rounded; mesonotum rather sparsely punctured, the parapsidal furrows deep, convergent, but not meeting, posteriorly; scutellum closely punctured. Pleuræ coarsely punctured, a smooth space on the mesopleuræ below the wings, propleuræ with a few oblique striæ. Median segment coarsely reticulate, the surface of the posterior truncation rugose; the metasternal process very short, its branches very little developed and not reaching beyond one-quarter from the base of the hind coxæ. Petiole separated from the metanotum by a distance equal to about one-third of its own length, smooth and shining. Hind coxæ finely punctured, longer spur of the hind tibia two-thirds of the length of the hind metatarsus; tarsal ungues with a very small tooth near the middle. The subcosta is joined by the basal nervure at a distance from the stigma not exceeding two-thirds of the length of that nervure from the discoidal cell to the subcosta, the latter somewhat thickened beyond the junction.

Hab. South Africa, Mossel Bay; April and November (*Turner*); Port St. Johns; May (*Turner*). This approaches very nearly to some species of *Evania* in the point of junction between the basal and subcostal nervures, but the distance from the stigma is greater than in any species of *Evania*, though not nearly so great as in typical *Parevania*.

Prosevania interstitialis, Cam.

Evania interstitialis, Cam. Spolia Zeyl. iii. p. 74 (1905). ♂.

Prosevania peradeniyæ, Cam.

Evania peradeniyæ, Cam. Spolia Zeyl. iii. p. 75 (1905). ♂.

These are included in *Evania* by Kieffer in his monograph of the family. I consider that *peradeniyæ* is only a variety of *interstitialis*.

Genus PAREVANIA, Kieff.

The following species described by Cameron under *Evania* and retained in that genus in Kieffer's monograph belong here: *P. curvicarinata*, Cam., *P. albitarsis*, Cam., and *P. erythrothorax*, Cam. (=*leucostoma*, Kieff.).

Specimens of all these species, marked "Type" by Cameron, are in the British Museum, and were not seen by Kieffer, who had to depend entirely on the descriptions.

Plutofœnus edwardsi, sp. n.

♀. Nigra, opaca; mandibulis fusco-ferrugineis, dentibus nigris; tegulis fusco-ferrugineis; terebra valvulisque ferrugineis, apice luteo-ferrugineis; alis hyalinis, venis fuscis.

Long. 16 mm.; terebræ long. 23 mm.

♀. Head coriaceous, rather sparsely punctured, with delicate white pubescence, a short longitudinal carina between the antennæ. Posterior ocelli twice as far from each other as from the eyes, the latter separated from the hind margin of the head by a distance equal to about two-fifths of their length; cheeks slightly longer than the first joint of the flagellum. Second joint of the flagellum twice as long as the first, third nearly as long as the two basal joints combined. Hind margin of the head shallowly emarginate; neck very short. Thorax rugose; pronotum rounded at the anterior angles; the divergent furrows dividing the scutum and præscutum not very distinct owing to the coarseness of the sculpture, scutum only a little shorter than the præscutum. Scutellum with a distinct median carina, the sculpture of the median segment much less coarse than that of the thorax. Metatarsus of the hind leg a little shorter than the four apical tarsal joints combined. The second transverse cubital nervure extends from the radius halfway to the cubitus, and is faintly continued almost to the cubitus. The first discoidal cell is twice as long as the second, which is subquadrate. The radius is sharply bent at the point of junction with the second transverse cubital nervure.

Hab. Potrerillos, Mendoza Province, Argentina; January 6, 1927 (*F. and M. Edwards*). 1 ♀.

Family **Braconidæ**.

Orgilus lucidus, sp. n.

♀. Nigra, opaca; flagello articulis septem basalibus, pedibus anticis, coxis intermediis, trochanteribus intermediis posticisque, tergito primo apice late lateribusque, sternito primo, tergito secundo dimidio basali sternitoque secundo fere omnino flavo-ochraceis; palpis, tibiis intermediis posticisque basi late, calcaribusque albido-flavis; alis hyalinis, venis fuscis.

Long. 4 mm.; terebræ long. 2 mm.

♀. Antennæ about three-quarters of the length of the whole insect, 28-jointed, the twelve apical joints moniliform. Head and thorax very closely and minutely punctured; face with the usual two deep foveæ above the mandibles. Thorax covered thinly with short pale hairs; parapsidal furrows deep, the furrows of the mesopleuræ crenulate. Median segment finely reticulate, both on the dorsal surface and on the sides. Abdomen finely and very closely rugose aciculate, the sutures, except the first, crenulate; valvulæ as long as the abdomen. Second tergite as long as, or a little longer than, its basal breadth, broadened posteriorly.

Hab. Port St. Johns, Pondoland; May 1924 (*Turner*).

One female and four males taken on the path to the light-house. A female taken in the same locality in June 1923 measures only 2 mm. in length.

The species differs from the others described from S. Africa in the much shorter terebra, in the much greater extent of colour, and in the smaller size, as well as in details of sculpture.

Helorimorpha exilis, sp. n.

♂. Fulva; antennis 18-articulatis nigris, articulo apicali fulvo, preapicalibus tribus fuscis; scapo fulvo; alis hyalinis, venis fuscis.

Long. 4·5 mm.

♂. Head transverse, finely and very closely punctured above, more finely and not quite so closely on the face and clypeus, an impressed line running from between the antennæ towards the anterior ocellus. Second joint of the flagellum twice as long as the first, the third joint nearly equal to the second, the ten apical joints distinctly moniliform. Malar space fully half as long as the eye. Thorax and median segment rather coarsely reticulate; abdomen smooth and shining. Petiole nearly two-thirds as long as the thorax and median segment combined, very slender and pale yellow to beyond the middle, then slightly broadened and fulvous to the apex. Recurrent nervure interstitial with the first transverse cubital nervure; nervulus postfurcal by a distance equal to about half the length of the recurrent nervure; second discoidal cell open at the apex, neuration beyond the cells almost obsolete.

Hab. Mackay, Queensland (*Turner*), March 1900. Type in British Museum.

This is the first species of the genus described from the Australian region. The sculpture of the thorax and median segment, though similar to that of African and American species of the genus I have seen, is distinctly less coarse. *Erythrometeorus*, Cam. (1911), is a synonym of *Helorimorpha*. Brues considers that the African *H. coffeæ* is probably a parasite of the fruit-fly, which would give species of the genus considerable economic importance.

Family Ichneumonidæ.

Pezomachus zuluanus, sp. n.

♀. Brunneo-ferruginea, aptera; flagello sordido stramineo, petiolo apice basique, metatarsis posticis basi calcaribusque albidis; antennis 23-articulatis, articulis 11–22 longitudine latioribus, articulis sex apicalibus discretis, fere moniliformibus; palpis nigris.

Long. 3·5 mm.

♀. First joint of the flagellum longer than the second by about one-quarter, the eight basal joints distinctly longer than broad, the ninth very slightly so, the remaining joints, excepting the apical one, broader than long, the apical joints are more discrete than is usual in the genus, yet without being narrowed at either extremity. Face and cheeks closely and minutely, scape more sparsely, punctured, all more or less clothed with delicate pale hairs, a shallow groove running from the base of the mandible to the eye; clypeus with distinct lateral foveæ at the base. Mesonotum very slightly longer than the median segment, very minutely punctured, almost covering the scutellum, which is very small. Median segment smooth without carinæ or apophyses. Abdomen coriaceous; petiole about as long as the second and third tergites combined, these latter about equal to each other in length; the petiole margined laterally. Terebra as long as the abdomen, if measured from the base beneath the abdomen, valvulæ about two-thirds as long as the abdomen. Legs stout, calcaria short, the longer spur of the hind tibiæ less than half as long as the hind metatarsus.

Hab. Eshowe, Zululand; May 1926 (*Turner*). 1 ♀.

Taken on rotten wood in dense forest.

The occurrence of this northern genus in South Africa is remarkable. The terebra is much longer than in other species.

Genus HEMITELES.

Subgenus NEOTHEROSCOPUS, nov.

♀. Differs from *Theroscopus* in having the head scarcely prolonged behind the eyes, and in the sculpture of the median segment and basal tergites.

Wing rudimentary, scarcely reaching the base of the median segment, petiole and second tergite closely longitudinally striated; median segment not areolate, margined laterally, transversely striated, more finely on the basal half than on the apical, apophyses well developed and acute, a short, raised, transverse carina between, but above them and not extending to them; the apical slope of the segment very abrupt, the surface finely transversely striated.

Type of the subgenus, *Hemiteles* (*Neotheroscopus*) *caffer*, sp. n.

Hemiteles (*Neotheroscopus*) *caffer*, sp. n.

♀. Nigra; antennis, valvulis, terebra, pedibusque brunneo-ferrugineis; mesonoto fusco-ferrugineo; trochanteribus albidis.
Long. 4 mm.; terebræ long. 1 mm.

♀. Antennæ 23-jointed, the three basal joints of the flagellum long, of about equal length, the fourth joint scarcely two-thirds of the length of the third, but longer by one-quarter than the fifth, the succeeding joints shorter, but all longer than broad. Head broad; the eyes very large, touching the base of the mandibles and almost extending to the hind margin of the head; ocelli rather large, placed near to each other, in an equilateral triangle. The whole head finely and closely transversely striated. Thorax much narrower than the head, almost smooth; the parapsidal furrows very deep, the mesonotum between them divided by a deep longitudinal groove; scutellum raised and subtuberculate in the middle. Median segment as in the subgeneric description. Petiole distinctly shorter than the second and third tergites combined, broadened from the middle and rather sharply deflexed just before the apex, spiracles situated far behind the middle. Both the petiole and second tergite closely and rather strongly longitudinally striated; the remaining segments smooth.

Hab. Eshowe, Zululand; April 1926 (*Turner*). 1 ♀. Taken on rotten wood in dense forest.

PROCEEDINGS OF LEARNED SOCIETIES.

GEOLOGICAL SOCIETY.

May 25th, 1927.—Dr. F. A. Bather, M.A., F.R.S., President, in the Chair.

The PRESIDENT exhibited a specimen of coral-rock dredged by the Eastern Telegraph Company from a depth of 378 fathoms about 45 miles north-west of Jebel Teir, at the south-eastern end of the Red Sea. The fragment was heavily coated with manganese, suggesting that it had lain for some years at a considerable depth. On one side of the specimen, however, was a coating of foraminifera determined by Mr. A. Earland as *Sagenina divaricans* Cushman, *Nubecularia tubulosa* Heron-Allen & Earland, *N. lucifuga* Defrance, and *Placopsilina cenomana* A. d'Orbigny. These and other organisms indicated that the rock had of recent years been well within a depth of 100 fathoms. The evidence of the specimen suggested oscillation of the sea-floor, due to volcanic agency, and a sudden sinking of recent date. The Company's cable, laid about six years ago, had been interrupted on December 28th, 1926, at 345 miles from Port Sudan in 500 fathoms, and again, after repair, on January 5th, 1927, in a spot 10 miles south of the repair at 530 fathoms. New shoals were recorded by the Admiralty in this region about the same time.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[NINTH SERIES.]

No. 120. DECEMBER 1927.

LXXIV.—*Contributions towards a Knowledge of the European Thysanoptera.*—III. By Richard S. Bagnall, F.R.S.E., F.L.S.

This is continued from Ann. & Mag. Nat. Hist. ser. 9, vol. xix. pp. 564–575 (May 1927), and contains the descriptions of *Holarthrothrips tenuicornis*, gen. et sp. n., *Chirothrips ammophilæ*, sp. n., *Limothrips minor*, sp. n., *Aptinothrips melanophthalmus*, sp. n., *Rhamphothrips karnyi*, sp. n., *Dendrothrips ornatus*, var. *schillei*, nov., *Dendrothripiella decoris*, sp. n., *Prosopothrips nigriceps*, sp. n., *Oxythrips tristis*, sp. n., *Amblythrips ericicola*, sp. n., *Baliothrips vittipennis*, sp. n., *Thrips euphorbiella*, sp. n., *T. dorsalis*, sp. n., *Treherniella stœchas*, sp. n., *Cephalothrips spartiicola*, sp. n., *Cephalothripoides*, gen. nov. (for *Cephalothrips harrisoni*, Bagn.), *Phlœothrips immanis*, sp. n., and *P. parvulus*, sp. n.

In addition, an English record of *Thrips albipes*, Bagn., is given, as the species is an addition to the European fauna; and the winged form of *Cephalothrips hispanicus*, Bagn., and the male and larvæ of *Liothrips amabilis*, Bagn., are described, the food-plant of the latter being ascertained.

The olive-thrips—*Thrips oleæ* of Costa, 1857—is recognized as a *Liothrips*, and *novaki*, Karny-Priesner, reduced as a synonym of that species; whilst the tamarisk-thrips—*Liothrips dampfi*, Karny—is shown to be the same as *L. reuteri*, Bagn., and the name reduced as a synonym thereof. *Hoplandrothrips ellisi*, Bagn., and *H. bidens*, Bagn., are shown to be distinct species.

Many of these species are of considerable importance, interest, or beauty, and the most outstanding form is *Holarthrothrips tenuicornis*, as it is the first European record of the superfamily HETEROTHRIPOIDEA, but is not related to *Heterothrips* so much as to the fossil genus *Opadothrips* of Priesner, and the family Opadothripidæ is erected for the two genera. *Rhamphothrips karnyi* and *Treherniella stæchas* are the first European species of those genera, whilst the new genus *Cephalothripoides* would seem to bring *Cephalothrips* into closer association with *Phlœothrips* than has hitherto been suspected.

Most of these discoveries were made during a short trip covering the first ten days in September of this year; but, as much of my time was occupied in sea- and sun-bathing, the actual collecting could be counted in hours, and the results only serve to illustrate the wealth of this region and how much might be achieved by concentrated effort over a reasonable period.

Despite the short time that has been devoted to collecting in France, its known Thysanoptera fauna is now as great as that of Great Britain or Austria, and, on account of its geographical situation and physical features, I have little doubt that it will soon head the list of European countries in respect to the number and variety of thrips.

Superfamily **HETEROTHRIPOIDEA**, Bagn.

Family **Opadothripidæ**, nov.

With the characters of the genera *Opadothrips*, Pr., and *Holarthrothrips*, nov., and especially differentiated from members of the Heterothripidæ by the structure and sensoria of the intermediate antennal joints.

Genus HOLARTHROTHRIPS, nov.

Head and prothorax Melanothripid in appearance; postocular bristles absent; pronotum with a series of several pairs of postero-marginal setæ of which the outmost is the longest, and two prominent ones at each anterior angle. Antennæ long as in the fossil genus *Opadothrips*, Pr., 9-jointed and all freely movable; 3 and 4 markedly annular, broadened outwardly near apex to seat a special type of lanceolate sense-cone as in *Opadothrips*; the following (5–9) narrower, progressively less distinctly annular, long and cylindrical, and 6 longer than either 5 or 7 as in *Melanothrips* and *Opadothrips*. Eyes not pilose; mouth-cone short; maxillary palpi 3-jointed, labial palpi presumably 2-jointed, but having the appearance of being single-jointed. Wings Heterothripid and Thripid in type, fore-wing with two long veins each regularly set with setæ; setæ of costa long and fine. Apex of fore-tibia unarmed; fore-tarsus armed as in *Heterothrips*. Abdomen and ovipositor Thripid (from a dorsal view); the under margin of "saw" strongly serrate; tergite of segment 8 completely fringed; tergites 2–7 with an irregular lateral fringe, and pleurites similarly fringed.

Type. *Holarthrothrips tenuicornis*, sp. n.

This genus comes nearest to Priesner's fossil genus *Opadothrips*, and is identical with it in the structure of the antennæ. It is certain that *Opadothrips* belongs to this group, and not to the Æolothripoidea, to which Priesner refers it (despite a wing-structure approximating the Heterothripidæ), and it would seem to differ from *Holarthrothrips* in the chætotaxy of the head and pronotum.

Holarthrothrips tenuicornis, sp. n.

♀.—Length about 1·35 mm.; breadth of mesothorax 0·38 mm., and of abdomen near middle c. 0·42 mm.

With the characters of the genus.

Colour dark grey-brown, head and abdominal segment 9 and sides and fore-margin of pterothorax darker and pronotum lighter. Legs pale yellow, with femora, especially the intermediate and hind pair, more or less shaded with light grey-brown. Fore-wings lightly fumate, inclined to be lighter basally. Antennæ light grey-brown, joint yellowish especially distally, and 3 and 4 clear lemon-yellow.

Pronotum transverse, about the same length of head; postero-margin with nine pairs of more or less strong bristles, of which 1 and 3 are longer (and paler than the others), being 80–86 and 52–60 μ respectively, whilst 5 and 6 are longer than the one preceding or the remainder following, being 38–43 μ; antero-angular setæ forwardly directed, 30–38 μ long. Fringe of abdominal tergite 8 irregular, up to 19 or 20 μ in length; bristles of segments 9 and 10 yellow, strong, the longest (that is, the inmost pair of long ones) being at least 140 μ long on 9 and 86 μ on 10, the length of the segments bearing them being 112 and 70 μ respectively.

Fore-wings long, somewhat broad, upturned and tapering distally, about 14·5 times as long as broad near middle; cilia long and setæ of costa also long, colourless, and cilia-like, those near middle being 90 μ in length, more than 0·5 the length of cilia; lower vein with series of fifteen to sixteen longish dark setæ and a basal series of four lighter ones; upper vein with thirteen shorter and less strong setæ in addition to a basal series of eight to nine.

Length (and breadth) of head and pronotum 146 (192) and 146 (260) μ respectively; length (and breadth near middle) of fore-wing 1080 (74) μ. Length (and breadth) of antennal joints 1–9 approximately as follows:—

22 (28) : 40 (28) : 54 (22) : 48 (20) : 43 (16) : 49 (15) :
38 (12) : 27 (10) : c. 30 (6·5) μ.

Length (and breadth) of femora and tibia i., ii., and iii. 135 (40), 140 (38), and 200 (37) μ respectively.

Hab. S. FRANCE, St. Cyr-sur-Mer, 1 ♀ on vine, Sept. 1927.

Superfamily **THRIPOIDEA**, Hood.

Family **Thripidæ**, Hal.

Heliothrips bicinctus, Bagn.

A pretty species originally described from Spain and North Africa, but also known from hot-houses.

Hab. S. FRANCE, Plage d'Hyères, 1 ♀ with countless *Heliothrips hæmorrhoidalis* on *Smilax aspera*, Sept. 1927.

Heliothrips hæmorrhoidalis, Bouche.

Females and larvæ only, not uncommon on several plants—*Clematis vitalba*, *Lonicera implexa*, *Quercus coccifera*, *Phyllirea angustifolia*, *Pistacia lentiscus*, etc.,—and in very large numbers on *Smilax aspera* accompanied by the variety *abdominalis*.

Chirothrips aculeatus, Bagn.

Hab. S. FRANCE, St. Cyr-sur-Mer, in numbers on a species of *Triticum*, ♀ ♀ only, Sept. 1927.

Chirothrips ammophilæ, sp. n.

♀.—A large species like *C. similis*, Bagn., nec Pr., in size and form.

The head is more strongly produced beyond the eyes than in *similis*, the relative lengths of the head-areas in the two species being as follows :—

	C. ammophilæ.	*C. similis.*
	μ.	μ.
Præocular	15	7–8
Ocular	60	60
Postocular	25	25

So that the præocular extension represents 0·6 the postocular as compared to 0·3 in *similis.*

The postero-angular pronotal bristles are pale and longer and more slender than in *similis*, the outer one being 54–56 μ long in *ammophilæ*, as compared to 42–45 μ in *similis.* Fore-wings with four (rarely five) setæ in the lower vein.

The antennæ are markedly longer, the relative lengths (and breadths) of joints 3–8 in the two species being approximately as follows :—

C. ammophilæ. 33 (24) : 35 (25·5) : 32 (23) : 44·5 (19) : 12 : 11 μ.

C. similis. 30 (25·5) : 34 (27) : 24 (20) : 39 (19) : 11 : 9 μ.

Joint 3 is yellowish and 4 brown, but not the dark greyish-brown of the following joints.

Hab. S. FRANCE, on *Ammophila arenaria* and probably of wide distribution ; St. Cyr-sur-Mer and Plage d'Hyères, ♀ ♀ only and in large numbers, Sept. 1927.

Limothrips angulicornis, Jabl.

Hab. S. FRANCE, near the Tour Fondeu pier, Giens peninsula, with *Bregmatothrips dimorphus* on grass, 2 ♀ ♀ only, Sept. 1927.

Limothrips minor, sp. n.

Confused with *Limothrips cerealium*, Hal., is a smaller, more slender, and lighter-coloured species, distinguished also by its shorter legs, shorter antennal joints 3 and 6, narrower wings, and shorter bristles. It would appear to be a more southern species, and especially common in Sardinia.

I have considered it helpful to make a comparative description of the two species—*cerealium* from North of England examples and *minor* from Sardinian examples.

L. minor is of a reddish-brown colour as compared to a deeper chestnut to blackish-brown in *cerealium.* It is somewhat smaller and noticeably narrower, as will be seen from the breadth of the mesothorax and the fifth abdominal segment in the following comparative measurements (in microns), which will serve to distinguish the species :—

	♀ *cerealium.*	♀ *minor.*
1. Body.		
General:		
Breadth of mesothorax	338	300
" abdominal segment 5	386	324
Head:		
Length (to fore margin of eyes)	166	138
Breadth at base	190	156
" across eyes	166	142
Pronotum:		
Length (and breadth)	148 (256)	135 (200)
2. Appendages.		
Length of fore-wing	1150	800
Breadth near base and middle	100:75	72:44
Length (and breadth) of tibia i.	118 (52)	110 (44)
" " " ii.....	135 (60)	110 (40)
" " " iii.....	195 (62)	135 150 (40)
3. Bristles and setæ, length of:		
Interocellar	34	16-20
Pronotal antero-angular	68	38 50
Abdominal segment 9 longest	170–190	130–150
" " 9 inmost	100–108	90
" " 10 outer	95	62-65
Fore-wing:		
Costa near middle	60–68	45–50
Veins " "	45–50	26–30

All the bristles and setæ in *minor*, apart from being shorter, are very noticeably finer.

The antennal joint 3 is noticeably shorter in *minor* than in *cerealium* as compared to the other joints, and has the outer distal angle (seating sense-cone) less acute, so that the joint is less noticeably asymmetrical. The relative lengths (and breadths) of the antennal joints 2 to 8 are approximately as follows :—

L. cerealium, Hal. 38 (31) : 54 (26) : 41 (23) : 41 (22) : 60 (21) : 13 (9) : 16 (6) μ.

L. minor, sp. n. 38 (27) : 43 (22) : 38 (21) : 38 (21) : 54 (19) : 12 (8) : 14 (5·5) μ.

♂.—The relative lengths (and breadths) of antennal joints 2 to 8 are approximately as follows :—

28 (26) : 38 (21) : 29 (21) : 27 (20) : 43 (19) : 8 : 11 μ.

I have not sufficient material of this sex to make a closer study at the moment.

The form of the third antennal joint and the short hind tibia, together with the slender form, the more slender wing, and the shorter and finer bristles serve to distinguish the female.

Hab. SARDINIA, Sorgono, common (*A. Krausse*). I also have a few examples from the south of France and England.

Genus APTINOTHRIPS, Hal.

Head longer than the pronotum and at least 1·25 times as long as broad across eyes; sides more or less subparallel; eyes not prominent, occupying 0·3 to 0·35 the dorsal length of head. Legs short and stout. Apical abdominal setæ shorter	*A. rufus*, Hal., *elegans*, Pr., [and *nitidulus*, Hal.
Head shorter than the pronotum and approximately as broad across eyes as long; cheeks narrowed behind eyes, which are large and prominent, occupying more than 0·5 the dorsal length of head. Legs noticeably longer and more slender. Apical abdominal setæ longer	*A. melanophthalmus*, sp. n.

Aptinothrips melanophthalmus, sp. n.

♀.—This species is much the same form (except for the characteristic head) as *rufus* and *elegans*, and the same size as the latter. The legs are noticeably longer and less stout, the hind tibia measuring 108 (32) μ, as compared with c. 90 (38) μ in both *elegans* and *rufus*. The apical abdominal bristles are noticeably longer than in the other known species, being 92 and 68 μ long on segments 9 and 10 respectively.

Colour pale yellow to horn-colour, with the mouth-cone and extreme apex of abdomen tipped with brown and eyes black as in the two yellow species *rufus* and *elegans*. The antennæ, however, are paler, joints 1, 3, and 4 almost colourless, and 2, 5, and 6 being of a uniform dark grey-brown. The form of the head makes the species a very distinctive one. It is slightly produced in front of the large somewhat bulging eyes, as in *Chirothrips*, whilst the short subparallel cheeks are narrower than the width across the eyes (95 : 103 μ) and only 0·75 the length of the eye.

The antennæ are much as in *rufus*, but with the segments 3–5 longer, more elongated, and 4 and 5 with shorter stems, the relative lengths (and breadths) of joints 2–6 being approximately as follows :—

24 (23) : 24 (16) : 27 (17) : 28·5 (16) : 51 (16) μ.

Hab. S. FRANCE, l'Estaque, near Marseille, 1 ♀ on a crucifer (casual), Sept. 1927.

Dendrothrips ornatus, Jabl.

Hab. SPAIN, Saragosa, 1913, ♀ ♀ only (*Navas*).

Dendrothrips ornatus, var. *schillei*, nov.

The banded fore-wings of the typical form in my collection from England, Spain, Germany, Bohemia, Galicia, Hungary, and Norway agree in that the light and dark markings, exclusive of the ultimate light and dark area at tip, are approximately subequal, as figured by Uzel.

A specimen in my collection from Galicia (ex coll. Schille) has the white areas considerably extended, so that the first and second white areas are each at least 1·5 times as long as the adjacent brown areas, instead of being approximately subequal. The following approximate measurements of areas in a typical example from Spain and the variety illustrates the difference, the alternate figures representing dark and light areas, commencing with the dark basal area :—

Forma typica. 8 : 8 : 9 : 7 : 8 : 4 : 2·5.

Var. *schillei*. 7 : 12 : 8 : 12 : 7 : 7 : 2.

Hab. GALICIA (*coll. Schille*), after whom I have pleasure in naming the form.

Dendrothrips degeeri, Uzel.

Hab. S. FRANCE, Ax-les-Thermes, several examples from *Fraxinus*, August 1926.

Dendrothripiella decoris, sp. n.

♀.—Length about 0·8 mm.

Head dark blackish brown, lighter medianly, eyes black, ocelli with red hypodermal pigmentation ; pronotum (except for a pair of dark spots) and abdomen pale creamy white. Mesothorax medianly reddish-yellow with a good deal of hypodermal pigmentation, laterally dark greyish-black to black; metathorax medianly pale, with darker area and hypodermal pigmentation at each side, laterally deep greyish-black to black; scutellar area dark grey. Fore-wings with extreme base fumate and end of scale greyish-black, then a clear band and rest of wing, a total of 0·7 the length or thereabouts, of a uniform dark grey inclined to be paler (except the edges) near tip; hind-wing with longitudinal vein dark. Abdomen with two dark eye-like areas on tergite 7, and the preceding tergites each with a row of four dark spots, the outer being the darker, and inclined to merge in some specimens.

Antenna with the first joint grey, 2 dark grey-brown, 3–5 clear yellow, and 6 and style dark grey-brown. Legs dark grey-brown to almost black, tarsi and tips of tibiæ pale.

A very distinct species, without pronotal setæ and having the antennæ distinctly 7-jointed in the ♀, but in some examples there is a distinct or an indicated oblique suture in the sixth joint, as in *Dendrothrips ornatus* and *degeeri*, but this is rare, and I have not yet seen a specimen in which this suture is complete in *both* antennæ. The intermediate joints 3–5, excluding the stem of 3, are subequal in length and breadth, and 6 is narrowly and elongated pyriform and at its broadest narrower than the preceding joints. The relative lengths (and breadths) of the joints 3 (including stem) to 7 in a normal example are approximately as follows:—

29·5 (16) : 27 (16) : 27 (16) : 38 (12) : 6·5 μ.

♂.—Length 0·45 to 0·5 mm.

Colour of head, pronotum, and pterothorax much as in the ♀, but not so dark; abdomen very small, narrower than the pterothorax, pale, but without the dark markings of the ♀. Antenna with joints 1 and 2 almost colourless, 3 and 4 pale but shaded with ashy-grey distally, 5 pale ashy-grey in distal half, and 6 and style grey. All legs pale. In all the examples before me the antennæ are clearly 8-jointed, joints 6 and 7 being broadly and somewhat obliquely united; the relative lengths (and breadths) of the joints 3 to 8 are approximately as follows, 3 including the longish stem:—

28·5 (15) : 25 (14) : 27 (14) : 30 (12) : 8 : 9 μ.

Hab. S. France, Plage d'Hyères, both sexes in numbers by beating a compact group of bushes composed chiefly of *Quercus coccifera* with a little *Phyllirea*, and bound together by *Smilax aspera*, September 1927. Also 1 ♀ at Porquerolles (Iles d'Hyères) on *Phyllirea.*

Dendrothripiella phyllireæ, Bagn.

Hab. S. FRANCE, common on *Phyllirea angustifolia*, Tamaris, near Toulon, Carqueiranne, Plage d'Hyères and Iles d'Hyères (Porquerolles), Sept. 1927. I was unable to find the ♂, which is as yet unknown.

Genus PROSOPOTHRIPS, Uzel.

1. Head and prothorax dark brown, fore-femora brown, rest of body golden-yellow (except the mesothorax in *vejdovskyi*), antennal joints 6 (except basally), 7, and 8 yellowish-brown .. 2.
   Head only dark chestnut-brown, antennal joints 1, 6 (lighter basally), 7, and 8 dark brown. Intermediate antennal joints approximating those in *cognatus*, joint 6 fusiform .... *P. nigriceps*, sp. n.
2. Head about 0·8 times as long as broad; intermediate antennal joints more slender, 3 at least 2·5 times as long as broad and 1·25 times as long as 4. Mesothorax brown .... *P. vejdovskyi*, Uzel.
   Head as long as broad; intermediate antennal joints shorter and stouter, 3 about 1·8 times as long as broad and subequal to 4 in length and breadth. Pterothorax wholly yellow .. *P. cognatus*, Hood.

Prosopothrips nigriceps, sp. n.

This species is the same size and general form as in *cognatus*, which, in the longer head and shorter intermediate antennal joints, it most nearly approaches. It is readily distinguished from both *cognatus* and *vejdovskyi* by its yellow pronotum and fore-legs and by the brown first antennal joint. In life the head has a very shiny black appearance. The relative lengths (and breadths) of the antennal joints 2–8 are approximately as follows :—

43 (31) : 36 (19) : 34 (18) : 35 (19) : 57 (21) : 11 : 12 μ.

Hab. S. FRANCE, Plage d'Hyères ; Iles d'Hyères (Porquerolles) and St. Cyr-sur-Mer, plentiful on a short grass growing on or near sandy beaches, ♀ ♀ only, Sept. 1927.

Oxythrips tristis, sp. n.

Length about 0·9 mm., breadth of mesothorax c. 0·22 mm. Colour dull blackish-grey, head and pronotum darker than abdomen, and pterothorax brownish; eyes purplish-black, ocelli without hypodermal pigmentation; fore-wings lightly tinged, more deep distally than basally; all tibiæ yellowish distally and tarsi pale yellow. Antennæ dark grey-brown, joint 1 pale, 3 lighter than 2, and 3, 4, and 5 indistinctly pale at extreme base.

This species comes in the group *inopinatus*, Pr., *halidayi*, Bagn., *ulmifoliorum* (Hal.), Bagn., and *navasi*, Bagn., and, apart from being a more fragile form with strongly transverse intermediate abdominal segments, is at once separated from all in that the antennal segment 6 is only 1·20 to 1·22 times as long as 5, as compared to 1·37 to 1·6 in the others. Wing-cilia sparse, widely spaced; upper wing with 21 costal cilia, upper vein with 3 near base, 1 median and 1 + 1 in distal fourth, and lower vein with 7 (the more distal ones being more widely spaced) + 1 setæ; lower cilia wavy. Intermediate abdominal tergites strongly transverse, 4 and 5 only 60 μ in length and approximately four times as broad as long. Length of head to a line across fore-margin of eyes (and breadth) and length (and breadth) of pronotum approximately 98 (142) and 98 (162) μ respectively. Length of interocellar setæ situated immediately above each posterior ocellus c. 20 μ; of pronotal postero-angular setæ 31 μ; of bristles on abdominal segment 9 70 to 95, and on ten outer 62 and inner 70 μ, the length of the segments bearing them being 44 and 54 μ respectively. Length (and breadth) of antennal segments 2–8 approximately as follows:—

38 (23) : 40 (17·5) : 35 (16·5) : 33 (16) : 40 (16) : 8 : 10 μ.

Hab. S. FRANCE, 1 ♀, Plage d'Hyères, in flower of *Eryngium maritimum*, Sept. 1927.

Drepanothrips reuteri, Uzel.

Hab. S. FRANCE, on the banks of the Ariège near Ax-les-Thermes in the Eastern Pyrenees, 1 ♂ and several ♀ ♀, on *Corylus*, August 1926; Pesquiers, near Plage d'Hyères, 1 ♂ whilst beating grass, Sept. 1927. In regard to the latter record, I observed neither *Betula* nor *Corylus* in the neighbourhood.

Genus RHAMPHOTHRIPS, Karny.

The following is the first European species recorded of this genus, of which three species have been described from Java :—

Rhamphothrips karnyi, sp. n.

♀.—Length about 0·85 mm.

Colour : head, abdomen, and limbs yellow; thorax orange-yellow, eyes black, ocelli with crimson hypodermal pigmentation; tip of abdomen tinged with grey; fore-wings light grey, with veins darker; setæ dark. Antennæ with joint 1 pale, 2 yellowish to orange-brown, 3 pale greyish-brown, 4 darker, and 5–9 dark grey-brown.

Head small, transverse; very short, with the eyes prominent, occupying about 0·75 the total dorsal length; mouth-cone considerably extended, reaching to the mesosternum; maxillary palpi long and slender, with the middle joint darker than the others. Pronotum without prominent bristles, large, about 2·5 times as long as the head. Fore-wings with setæ well developed, costa with 16–18, lower vein 7–8, and upper vein with 3+3 in the basal area and 1+2 (1+1+1+1 in one example) in distal half. Fore-tibia simple. Abdomen elongate, not much broader than the pterothorax; apical setæ well-formed, straight and noticeable; tergite 8 without "comb."

Antennæ clearly 9-jointed, 6 and 7 closely and somewhat obliquely united, suggesting the oblique division seen in certain species of *Anaphothrips* etc. Relative lengths of the joints 2–9 approximately as follows :—

27 (21) : 30 (16) : 26 (16) : 31 (17) : 28 (16) : 8 (10) :
8 (6) : 9 (4) μ.

In the solitary example from Tamaris the antennal joints are longer than in the Porquerolles examples now described.

Length (and breadth across eyes) of head and length (and breadth) of pronotum approximately 54 (95) and 122 (135) μ respectively, but difficult to measure with accuracy. Width of mesothorax and abdominal segment 5 195 and 220 μ respectively. Wings short, length (and breadth near middle) of fore-wing 440 (35) μ. Length (and breadth) of tibia i. 56 (30), ii. 78 (28), and iii. 136 (27) μ. Length (and breadth) of joints of the maxillary palpi 19 (7) : 8 (4) : 10 (2·6) μ. Bristles of abdominal segment 9 and median pair on 10 c. 65 μ long.

♂.—Apparently of a darker yellowish-brown colour. The armature of the eighth abdominal segment is difficult to describe (as the only example of the ♂ is mounted on its side), but apparently consists of two pairs of stout spines set on tubercles, the longer situated medianly about 12 μ long and the shorter more lateral and upon a lower plane, about 0·65 the length of the median pair.

Hab. S. FRANCE, on *Erica arborea,* Porquerolles, Iles d'Hyères, 3 ♀ ♀ and 1 ♂, and Tamaris, near Toulon, 1 ♀, Sept. 1927.

Bregmatothrips dimorphus, Pr.

The striking colour of the small apterous ♂ makes this an easily recognizable species on the field.

Hab. S. FRANCE, L'Estaque near Marseille, St. Cyr-sur-Mer, Tamaris, Cargueiranne, Giens peninsula, and Plage d'Hyères, on short grasses, both sexes in approximately equal numbers, Sept. 1927. Previously known from Dalmatia, and probably of wide distribution in the Mediterranean littoral.

Amblythrips ericicola, sp. n.*.

♀.—Length about 1·1 mm.; breadth of mesothorax c. 0·174 mm.

Orange-yellow, head and thorax more deeply pigmented than the abdomen, inclined to orange-brown with the head shaded to grey-brown; extreme tip of abdomen dark grey-brown; legs yellow, being lightly tinged with pale grey, and wings very lightly fumate. Antennæ with the first two joints greyish-brown and the joints 3–8 greyish-black, with stem of 3 pale.

Close to *ericæ* (Hal.); the antennal joints are more slender, especially joint 3, which is furnished with normal and inconspicuous setæ, instead of the stout dark conspicuous ones seen in *ericæ*. The relative lengths (and breadths) of antennal joints 3–8 are as follows:—

31 (24) : 41 (19) : 40 (18·5) : 31 (16) : 46 (17) : 9 : 12 μ.

The bristles of the fore-wings are light-coloured and not so strong as in *ericæ*, the upper half of the fore-vein is furnished with 6+1 followed by a long space and 1+1 setæ near apex, whilst the hind-vein is furnished with 10–11 setæ.

---

* I cannot ascribe this to Priesner's *ericæ*, f. *pallens*, as the form and chætotaxy of the intermediate antennal joints, had that form been this species, could not have been overlooked by that author, whilst from his European Catalogue it is evident that both the typical form and f. *pallens* occur in Austria and Dalmatia. I have not seen *A. ericæ* from the Mediterranean littoral.—R. S. B.

♂.—Length c. 0·5 mm.

Much smaller and narrower than in *ericæ*; colour much the same as in the ♀, but abdominal segments 1–8 concolorous with head and thorax and 9–10 clear yellow. Bristles of pronotum and abdomen much shorter than in *ericæ*, as shown in μ below :—

	A. ericicola.	*A. ericæ.*
Pronotal postero-angular	13·5	41
Lateral abdominal :		
Segments 2–8	13–19	43–51
„ 9	54	95
„ 10	46	74
Interocellar	25	44

I have long been aware of the existence of a second species allied to *ericæ* occurring in the Mediterranean area on *Erica arborea*, having seen the ♀ from Spain, south of France, and Italy, but it was only recently I was able to secure an example of the minute ♂, and to thus more clearly demonstrate the identity.

The type is described from Porquerolles, Iles d'Hyères, Sept. 1927.

Baliothrips vittipennis, sp. n.

Somewhat smaller and more slender than *B. dispar*, Haliday, with the head and prothorax shorter and more transverse and the antennæ less stout. Colour of body and legs as in *dispar*, but the antenna with joints 3 and 4 unicolorous, clear yellow lightly tinged with grey, and the fore-wings clear but for a fumate patch after the basal third or thereabouts, and another occupying the apical fourth, the relative dark and light areas being approximately 270 : 162 : 270 : 252 μ. The hind-wing is only lightly shaded in the corresponding areas. The outstanding setæ of the outer edges of the tibiæ are markedly longer, stronger, and more conspicuous than in *dispar*, the distal pair of the fore-tibia being c. 50 μ in length, or approximately as long as the breadth of the tibia, as compared to c. 30 μ in *dispar*. In addition to the postero-angular setæ the posterior margin of the pronotum is furnished with three pairs of minor setæ in *dispar*—namely, a longer submedian pair c. 34 μ long and two at each side within and near the inner postangular and about 0·5 the length of the submedian, whilst this species is furnished with but two pairs of postero-marginals, the inner or submedian about as long as in *dispar*, and the outer situated midway between the submedian and the inner postero-angular and not much shorter than the former. The mid-lateral is well developed and almost as long as the outer postero-marginal, which latter are somewhat shorter and apparently darker and stouter than in *dispar*.

Bristles of fore-wings somewhat long and slender, upper vein with two in the distal half—one near tip and the other just outside the distal dark area; lower vein with c. 10 bristles; lower cilia wavy.

The relative lengths (and breadths) of the head and pronotum respectively are 135 (175) and 125 (220) μ, whilst the relative lengths (and breadths) of the antennal joints 3 to 7 are approximately as follows:—

B. dispar, Hal. 53 (23) : 43 (24) : 42 (25) : 52 (25) : 25 μ.

B. vittipennis, sp. n. 56 (20) : 43 (21) : 43 (21) : 54 (22) : 27 μ.

The chætotaxy of the abdomen is much as in *dispar*.

Hab. S. FRANCE, L'Estaque, near Marseille, on a grass growing on the stagnant estuary of a small stream near the sea, one ♀ only, Sept. 1927. I saw several examples, but, unfortunately, all but one that I collected in the belief that it was *Baliothrips* proved to be females of *Frankliniella tenuicornis*.

Thrips euphorbiella, sp. n.

♀.—Length about 0·9 mm.

Colour of a uniform lemon-yellow, wings very lightly tinged; antenna with joint 1 pale, 2 grey-brown; 3, 4, and 5 yellowish shaded to grey-brown distally; 6 yellowish in basal half and grey-brown in distal half, 7 grey-brown.

This would appear to be a small and more fragile edition of *T. euphorbiicola*, Bagn., at once separated by the possession of only six setæ in the distal part of the upper vein of the fore wing. The number of setæ on the fore-wing is costa 24–26, lower vein 14–16, and upper vein with 3+3 basally and 6 distally, the upper vein in one wing of one specimen having also one seta near middle.

The relative lengths in microns of the more important setæ and bristles as compared with the type-specimen of *T. euphorbiicola* are as follows:—

	T. euphorbiicola.	*T. euphorbiella.*
Pronotum:		
Outer postero-angular seta	40–42	26–30
Inner „ „	48–54	34–38
Abdomen:		
Segment 9, outer	100	72
„ 9, inmost............	60	50
„ 10, outer	76	60
„ 10, inner	84	54

The relative lengths of the antennal joints 2–7 are as follows, compared with the type-specimen of *T. euphorbiicola* :—

T. euphorbiella. 35 (24) : 38 (16) : 36 (17) : 30 (16) : 38 (16) : 12 μ.

T. euphorbiicola. — : 44 (20) : 42 (19) : 35 (19) : 47 (19) : 15 μ.

I have no doubt that more material and the discovery of the respective males will demonstrate still further differences.

Hab. S. FRANCE, Plage d'Hyères, 3 ♀ ♀ in flowers of *Euphorbia paralias* (a plant also known from British shores), Sept. 1927.

Thrips frankeniæ, Bagn.

Originally described from *Frankenia lævis*, I have this year taken it on that species and also on *F. pulverulenta*, and believe that it will prove to be widely spread on *Frankenia* spp.

Thrips albipes, Bagn.

I add this British record in view of the species (originally described from Japan) being new to the European fauna. The single specimen agrees in every particular with Japanese examples.

Hab. ENGLAND, one ♀ in flower of *Helianthemum chamæcistus* on the sea-banks near Horden, Co. Durham.

Thrips dorsalis, sp. n.

♀.—Near *T. tabaci.*

Pale yellow, abdominal tergites 4–8 with a transverse bar of greyish-brown (making the species very distinctive in life).

Antenna with joint 1 white, 2 light brown, 3 pale greyish, 4 and 5 grey-brown distally, but pale in the distal half or thereabouts, and 6 and 7 grey-brown. Bristles fumate, not long. Bristles of fore-wing only normally long, costa and lower vein with 24–25 and 13–14 respectively, distal half of upper vein with 3 to 5 disposed as to either 1 near middle and 1+1 distally, or 1+3+1; 1+2+1+1; or 1+2+1, but usually 1+1+1+1; lower fringe wavy.

Relative lengths of antennal joints 2–7 approximately as follows:—

34 (23·5) : 44 (18) : 43 (17) : 35 (16) : 46 (16) : 12·5 : 8 μ.

Length of outer and inner postero-angular pronotal setæ (which are short, stout, straight, dark, and pointed) 30–32 and 38–40 μ respectively, three pairs of inferior, somewhat stout, postero-marginal setæ, the inmost pair (19 μ) only slightly longer than the others. "Comb" of eighth tergite complete, fragile, cilia 10–14 μ long. Bristles of segments 9 and 10, 92 and 72 μ respectively.

This species differs from *tabaci* in the colour of the abdomen and antenna and shorter pronotal and wing-bristles and shorter fringe.

In flowers of *Verbascum* spp.

Hab. France, Etaples, vii. 25, and Spain, near Puigcerda, viii. 26.

The type is described from English examples found in Surrey.

Suborder TUBULIFERA.

Superfamily **PHLŒOTHRIPOIDEA**, Hood.

Bacillothrips longiceps (Reut.).

Hab. S. France, Plage d'Hyères, by beating the base of compact bushes of *Phyllirea* and *Spartium* fringing the sandhills, both sexes and larvæ, September 1927.

Bolothrips dentipes (Reut.).

Hab. France, Arcachon, banks of the Teste near its mouth, on *Juncus*, August 1926.

Bolothrips bicolor (Heeger).

Hab. S. France, Plage d'Hyères, 1 ♂ by beating grasses, September 1927.

Bolothrips cingulatus (Karny).

Hab. S. FRANCE, Plage d'Hyères, several examples (all but 1 ♀ of which were unfortunately lost in a tube with several *Bacillothrips*, *Compsothrips*, *Liothrips amabilis*, etc.) by beating grasses, September 1927.

Bolothrips brachyurus (Bagn.).

This belongs to the *Bolothrips* group, though the head is not so strongly characteristic as in the other species.

Hab. S. FRANCE, apparently widely distributed upon various grasses. Further records are :—L'Estaque near Marseille, St. Cyr-sur-Mer, Carqueiranne, Hyères neighbourhood, Giens, Iles d'Hyères near Porquerolle, September 1927.

Compsothrips albosignatus (Reut.).

Hab. S. FRANCE, Plage d'Hyères, both sexes and larvæ by beating near the roots of compact sheltered bushes growing at the edge of the sand-hills, sometimes with *Bacillothrips longiceps*, September 1927.

Genus TREHERNIELLA, Watson, 1923.

Watson erected this genus for *Haplothrips orlando*, Watson & Osborne. It comes in the *Cryptothrips* group, and is characterized by the short head, somewhat large eyes, the short broadly rounded mouth-cone, the very short and strongly transverse pronotum, the long series of duplicated cilia (15–20) in the fore-wings, and the armed fore-tarsus in both sexes. The genus is distinguished from its closest associate, *Gastrothrips*, Hood, by the larger eyes, the short mouth-cone, the more closely fringed wings, and the presence therein of duplicated cilia.

Treherniella stœchas *, sp. n.

♀.—Length c. 1·6 mm.

Dark blackish-brown, the head, antennæ, sides of thorax, and tube inclined to be darker than the rest of the body, fore-tibia distally and fore-tarsi shading to yellowish-brown. Antenna (much as in *Gastrothrips ruficauda*, Hood) wholly dark except for a minute pale area at base of joint 3. Wings broad, clear, basal scale only lightly fumate. Head as broad as long and about 1·75 times as long as the pronotum, which is fully 2·5 times as broad as long. Postoculars slightly less than the length of an eye. All pronotal setæ present, pale, the postero-angulars more than 0·6 the median length of pronotum. Antennæ with the relative lengths of joints 3–8 approximately as follows :—

---

* This name is taken from the old Greek name for the Iles d'Hyères, whereon its similarly-named food-plant is abundant.

72 (36) : 65 (35) : 61 (30) : 59 (27) : 54 (24) : 43 (16) μ.

Fore-tarsus with a sharp well-formed tooth. Fore-wing with 14–16 duplicated cilia and basal scale having the setæ pale, the first two very long and the third much smaller—namely, 68 : 85 : 24 μ. Abdominal bristles pale. Tube about 0·7 the length of the head and terminal hairs, which are somewhat dusky, distinctly longer than the tube.

Length (and breadth) of head, pronotum 230 (230) and 135 (310); breadth of mesothorax and second abdominal segment 380 and 400; length (and breadth) of tibia i., ii., and iii. 156 (50), 160 (44), and 216 (44) μ respectively. Length of tube and width at base and tip 184, 70, and 42 μ respectively.

♂.—Smaller and more slender; fore-legs more strongly to very strongly swollen, and fore-tarsal tooth larger. Paired spine of abdominal segment 9 fine and conspicuous.

Larva.—The full-grown larva is of a bright rose-red, short, stout, and somewhat convex. The last body-segment is black; the head, which is very small, and the legs are greyish-brown, whilst the 7-jointed antennæ are dark grey-brown, having joints 1 and 3 somewhat lighter and the apex of 2 very pale. Setæ pale and fine.

Hab. S. FRANCE, on *Helichrysum stœchas,* Iles d'Hyères, near Porquerolles, and on the Plage d'Hyères, both sexes and full-grown larvæ plentiful, September 1927.

Liothrips amabilis, Bagn.

♂.—Much as in the ♀; the pair of spines on abdominal segment 9 dark, pointed, and about 65 μ in length.

Larva.—The larva of the secondary stages is bulky in form, of a pale citrous-yellow colour, with all trochanters and femora greyish-black; the head is dark greyish-black, whilst the paired pronotal plates, the last two abdominal segments, and the lateral plates of segment 8 are black and sharply defined. The setæ are black, straight, and blunt at ends, whilst the antennæ have the joints 1 and 6 greyish-brown, and 5 shaded to pale grey-brown distally. The relative lengths of antennal joints are as follows :—

$$27 : 44 : 100 : 65 : 44 : 46\ \mu.$$

Joints 3–5 are widest at apex, whilst the sixth joint is cylindrical in its first two-thirds, then strongly restricted and continued, and so having the appearance of two joints.

Hab. Phyllirea angustifolia is the true food-plant of the species, which is probably of wide distribution. I have found it on the Iles d'Hyères near Porquerolles and at the Plage d'Hyères and Carqueiranne, September 1927.

Both the full-grown insects and the larva have the habit of curving the abdomen back over the fore-part at the slightest provocation, and of walking with the body so held, a habit that is shared by *Bolothrips brachyurus*, and which calls to mind the interesting little beetle *Encephalus complicans* of Westwood.

Liothrips reuteri, Bagnall. Tamarisk Thrips.

1913. *Compsothrips reuteri*, Bagnall.
1914. *Liothrips dampfi*, Karny.

Upon seeing living examples of the tamarisk thrips (*Liothrips dampfi*) recently, I was struck by their *Compsothrips*-like facies. I thereupon made a re-examination of my *Liothrips reuteri*, which I had originally described as a *Compsothrips*, and found that it was almost certainly the same species as *dampfi*, the latter name therefore falling as a synonym. It is well described and figured by Priesner in 1919 (Sitz. Akad. Wiss. in Wien. Mathem.-naturw. Klasse, Abt. i. 128, pp. 140–144).

Hab. S. FRANCE, Plage d'Hyères, on *Tamarix africana*, ♀ ♀ and larvæ only, September 1927.

Liothrips oleæ (Costa). Olive Thrips *.

1857. *Thrips oleæ*, Costa.
V. d. *Phlœothrips oleæ*, later authors.
1919. *Liothrips novaki*, Karny-Priesner.

---

* Since the above was written I have received a reprint, "La position Systématique de *Phlœothrips oleæ*, Costa (Thysanoptera)," by the Russian entomologist Oscar John (Ann. et Bull. Soc. Ent. Belgique, lxvii. pp. 121–122, 1927), in which the same identity and synonymy is expounded.

The true identity of the *Phlœothrips oleæ*, having so long remained unknown, and not having been successful in finding it myself, I was particularly glad to find that specimens so labelled by Haliday existed in the British Museum of Natural History. An examination showed that they were referable to the genus *Liothrips*, closely related to *L. hradecensis*, Uzel (*bagnalli*, Karny), and identical with *Liothrips novaki* (Karny), Priesner. In examples (♀ ♀ and 1 ♂) before me the abdomen is darker in its apical half, whilst the tube is darker in its basal half; the fore-wings have 18–20 duplicated ciliæ; the abdominal bristles are long, slender, and pale, the longest bristles of segment 9 being from 0·75 to 0·8 the length of the tube.

The specimens referred to are from Lucca in Tuscany, Italy, 1863.

Cephalothrips monilicornis (Reut.).

Hab. S. FRANCE, on fine grasses, Tamaris near Toulon iii. 27; St. Cyr-sur-Mer, Iles d'Hyères near Porquerolles, and the Plage d'Hyères, ♀ ♀ only, September 1927, *forma aptera* only.

Cephalothrips spartiicola, sp. n.

Forma aptera.—♀ near *C. coxalis*, Bagn., from which it differs by its shorter intermediate antennal joints (joints 3–5 measuring 41 (25) : 43 (29) : 46 (27), as compared with 46 (26) : 49 (30) : 52 (29) μ in *coxalis*), and the shorter fore-coxal seta which is only 22 μ long. Both the fore-coxal and the pronotal setæ are stout and very strongly dilated at apex, the pronotal postero-angular being 33 μ in length and 8 μ broad at apex; the "knobbed" setæ of the abdominal segments 7–9 are 44, 52, and 60 μ long, as compared with 40, 58, and 67 in *coxalis*.

Pale examples are yellow to greyish-yellow and have the sides of the head, the whole of the pronotum, the sides of the pterothorax and of the abdomen near the tip darker than the rest of the body except the end of the abdomen (segments 8–10), which is always very dark in colour. In such examples the coloration of the legs is much as in *coxalis*, except that the brown areas in the tibiæ are more extensive. In dark examples the femora are brown, though scarcely so dark as in the tibiæ, and the insect more strongly resembles *C. monilicornis*.

♂.—The darker male has the head brown, the fore-femora except apically brown, and the pronotum, fore-coxæ, and end of the abdomen (7–10 or 8–10) of a very deep blackish-brown. The fore-coxa is furnished with several spines, the fore-femur large and elongated, fore-tibia short and stout, and fore-tarsus armed with a large stout tooth. Some ♂ ♂ are lighter, with head and fore-femora yellowish, and also with the fore-legs less strongly developed.

Hab. S. FRANCE, Plage d'Hyères, in numbers by beating bushes of *Spartium junceum*, September 1927.

Cephalothrips hispanicus, Bagn.

♀. *Forma macroptera.*—The wings are narrow, colourless, with cilia sparse and somewhat widely spaced, and the fore-wing is without duplicated cilia.

The single example is smaller than the type and does not fully agree in its chætotaxy, but this may be due to the difference in apterous and macropterous forms. Some time ago I provisionally referred the species to the genus *Malacothrips*, but, as it would seem equally unhappy there as in *Cephalothrips*, I am recording it under its original name. This is the third example; the type (apterous ♀) is from Spain, an apterous ♂ from India, and now the macropterous form.

Hab. S. FRANCE, St. Cyr-sur-Mer, 1 ♀ from grass, September 1927.

Genus CEPHALOTHRIPOIDES, nov.

Resembling *Cephalothrips* and *Phlœothrips*, having the head and pronotum as in the former and the mouth-cone and antenna as in the latter, the mouth-cone being long and pointed and reaching across prosternum in *harrisoni*, or beyond it (as in *ornatus*). Wings narrow, fore-wings with duplicated cilia. Fore-tarsus unarmed in the ♀.

Type. *Cephalothrips harrisoni*, Bagn.

Congeneric with the American *Phlœothrips ornatus*, Hood, which, apart from its ornate appearance, has a longer head and mouth-cone.

Phlœothrips immanis, sp. n.

♀.—Length 3·4 to 3·8 mm.

This species, here described from a series taken in Switzerland, is probably confused with *coriaceus*. It would appear to be a rarer form than the true *coriaceus,* and is readily distinguished by its larger size and greater breadth, the more strongly and closely tuberculate cheeks, the longer tube, the longer intermediate antennal joints, the longer cephalic, coxal, and pronotal setæ, and the long more closely spaced series of 36–40 duplicated cilia in the fore-wing, as compared with 24–30 in *coriaceus.*

The following are comparative measurements in microns, those of *coriaceus* being taken from English (Warwickshire) examples. I have taken *immanis* in England (County Durham, 1911; Surrey, Oxfordshire, and Berkshire), but the smaller *coriaceus* is the commoner and more widely spread form; and, furthermore, examples in the British Museum (ex Haliday) belong to the smaller form, which we must regard as the true *coriaceus* :—

	♀ *coriaceus,* Hal.	♀ *immanis,* sp. n.
1. Body.		
Length (and breadth) of head	361 (298)	390 (324)
,, ,, pronotum .	230 (472)	324 (650)
Width of mesothorax	570	780
,, abdominal segment 3 . ..	600	810
Length of tube	340	400
Breadth of tube near base	96	114
,, ,, at apex............	48	54
2. Appendages.		
Length of fore-wing (and breadth near middle)	1566 (128)	1900 (162)
Length (and breadth) of tibia i.	256 (68)	340 (84)
,, ,, ,, ii.	274 (60)	352 (74)
,, ,, ,, iii.....	385 (64)	472 (82)
3. Chætotaxy.		
Length of postoculars..............	54	90
,, fore-coxal	54	90
,, postero-angular pronotal ..	110	148

The setæ at base of fore-wings comprise two stout blunt ones and one long fine one, the former being somewhat longer and stouter in *immanis* than in *coriaceus*, but the latter the same length in both species.

The relative lengths of the antennal joints are approximately as follows :—

P. coriaceus, Hal. 84 (42) : 148 (50) : 118 (50) : 104 (40) : 88 (34) : 69 (31) : 57 (20) μ.

P. immanis, sp. n. 95 (44) : 175 (53) : 148 (52) : 127 (44·5) : 106 (35) : 84 (30) : 60 (20) μ.

Hab. SWITZERLAND, in the Sihlwald near Zurich, both sexes and larvæ on logs, July 1925. I also know it from England, Belgium, and Denmark.

Phlœothrips parvulus, sp. n.

♂.—Length about 1·45 mm.

Colour dark chestnut-brown, inclined to be somewhat less dark, and the tube paler apically; mouth-cone, thorax, and abdomen with a good deal of crimson hypodermal pigment; wings with a faint yellowish tinge medianly, femora uniformly grey-brown, lighter than body; fore-tibia shading from yellowish-brown in the basal three-fourths or thereabouts to pale yellow distally, and all tarsi and tips of intermediate and hind tibiæ pale yellow; intermediate and hind tibiæ lighter near extreme base. Antennæ with joints 1 and 2 concolorous with head, 3 pale yellow with basal third suffused with ashy-grey, 4 and 5 light grey-brown with basal third or thereabouts pale yellow, 6 grey-brown with basal fourth pale, 7 and 8 darker grey-brown, 7 with basal fifth or thereabouts pale.

Head about 1·2 times as long as broad as in *parvus*, but cheeks not so swollen behind eyes as figured by Uzel for *parvus*. Antenna distinctly stouter than figured for *parvus*, nearly 1·8 times as long as the head, with joints 3 and 4 approximately subequal and less than twice as long as broad; 3 broadly obconical, with the inner margin incurved medianly; 4 with sides well rounded. Approximate lengths (and breadths) of the joints 2–8:—

41 (27) : 62 (35) : 60 (34) : 52·5 (27) : 47 (23) :
40·5 (22) : 30 μ.

Postoculars well developed, not quite as long as the eye. Pronotum short, only 0·55 as long as the head (compared to 0·65 in *parvus*) and 0·5 as long as broad; anterior angles acute; postero-angular setæ pale, less than 0·5 the median length of pronotum; medio-lateral and antero-marginal dark, well developed. Fore-leg with the coxa spinose, the femur well developed and about 0·4 as broad as long, tarsus armed with a short sharp tooth. Wings somewhat long but weak, clear but for the faintest yellowish tinge medianly, cilia fine; fore-wings with seven duplicated cilia. Abdomen slender, narrowing steadily from segment 2 to tube, which is about 0·6 the length of the head, a little more than 0·4 as broad near base as long; terminal hairs very fine, colourless except near base and a little longer than the tube. The spines on segment 9 (characteristic of the ♂) are dark and sharp and about one-third the length of the tube. Abdominal bristles (inclined to be stout and colourless) "knobbed," those on segments 8 and 9 being approximately 0·5 and 0·66 the length of tube respectively.

Length (and breadth) of head and of pronotum 210 (176) and 115 (230); breadth of pterothorax and abdominal segments 2, 5, and 8, 284 and 244, 210 and 155; length (and breadth) of tibia i., ii., and iii. 128 (34), 122 (32), and 162 (34); length of tube and breadth at base and at tip 128, 56, and 32 μ respectively. Length of postocular, fore-coxal, pronotal postero-angular, antero-angular, and mid-lateral setæ approximately 60, 38, 52, 44, and 41 μ respectively.

Distinguished by the short and broad intermediate antennal joints.

Hab. S. France, Plage d'Hyères, 1 ♂ with *Hoplandrothrips ellisi* by beating cut branches of *Pinus halepensis.*

Hoplandrothrips ellisi, Bagn.

This is a valid species, and the ♂ may be separated from ♂ *bidens*, Bagn., by the strong tooth near base of fore-tibia within, by the very long postocular and antero-angular pronotal setæ, which are 100–130 μ in length as compared with 70–95 μ in *bidens*. In *bidens* the first two basal setæ of the fore-wings are erect, blunt, and subequal in length, whilst 3 is more slender, pointed, and somewhat longer than the others, whereas in *ellisi* they are all blunt and 2 is noticeably longer than 1 and 3, the lengths in *bidens* being 62 : 62 : 81, and in *ellisi* 68·6 : 86·4 : 77, these latter figures being an average of twelve counts.

Hab. S. France, Plage d'Hyères, by beating cut branches of *Pinus halepensis,* ♂ ♀, September 1927.

LXXV.—*Fossil Insects in the British Museum.*

By T. D. A. Cockerell, University of Colorado.

Coleoptera.

Criocephalus (?) *pavitus*, sp. n. (Cerambycidæ).

Length 20 mm.; width across elytra 5·7 mm., of thorax 5 mm., of head about 4 mm.; length of elytra about 13 mm.

Dark brown or black, the legs also dark, form parallel-sided, with the aspect of the European *C. rusticus*, L.; the thorax apparently with median and lateral depressions on disc, but these are poorly indicated, the insect being in ventral view; sides of thorax nearly parallel (style of *C. rusticus*, not of the American *C. productus*, Lec.), but differing from the genus by a definite posterior constriction, after the fashion of *Pachyta*, though the bulge anterior to the constriction is much less marked; the lateral outlines of the broad head are in a line with the thorax, with no appearance of a neck (style of *Saperda*); the eyes do not protrude laterally; the antennæ are only partly preserved, but show the usual thick joint and small one following, but the long joints are cylindrical, not much constricted at base, the third joint parallel-sided, 2·5 mm. long, the fourth only 2 mm.; the femora are very stout, the anterior femur about 2·3 mm. long and 1·3 broad; hind femora 1·4 mm. broad.

Miocene of Florissant, Colorado (*Geo. Sternberg*, 105 B, with reverse).

Among the Florissant fossils this falls nearest to *Palæosmodicum hamiltoni*, Wickham, agreeing approximately in size, general form, and the stout (though much smaller) femora. The proportions of the antennal joints are quite different, though the two basal ones agree. Probably *C. pavitus* represents another extinct genus of Asemini, but it is hazardous to try to define it without more information. The antennæ seem to agree fairly well with those of the Burmese *Criocephalus exoticus*, Sharp, and in any case they differ considerably in the sexes.

Tenebrionites alatus, sp. n. (Tenebrionidæ).

Length 20·5 mm.; parallel-sided, with the form of *Tenebrio*; width of head 3·5 mm., of thorax 6, of abdomen near base about 6·5, of elytron near base 4.

Colour as preserved brown throughout; antennæ longer than width of thorax, tapering toward end, the middle joints about 3 to 2 mm., cylindrical, considerably longer than broad (thus unlike *Tenebrio*), third joint apparently not or little elongated; prothorax finely rugoso-punctate, transversely semilunar, with convex lateral margins and projecting anterior angles (anteriorly similar to *Hadrus*, but posteriorly quite different, the posterior lateral corners broadly rounded and retreating, as in certain *Eleodes*); elytra with only the basal 5 mm. preserved, pale brown, apparently of parallel-sided type, with an impressed line or groove close to lower margin, a pair of obtuse longitudinal ridges, 1 mm. apart, down middle, and the surface closely and irregularly beset with fine punctures, their distance apart about twice a puncture-width. Wings imperfectly preserved, but enough remains to show that they are long and well developed. Middle coxæ contiguous or nearly so; metasternum broad, with a marked longitudinal median sulcus (this sulcus is developed posteriorly only in *Tenebrio*); posterior coxæ large, transverse, the cavities separated by less than a third of a millimetre. Abdomen with five visible segments separated by straight hyaline sutures, the first three not visibly connate, but living species of the family show the sutures very clearly, and might present the same appearance if fossilized; apex of abdomen broadly rounded, the abdomen throughout like that of *Tenebrio*.

Miocene of Florissant, Colorado (*Geo. Sternberg*, 12 B, with reverse).

I place this in the blanket-genus *Tenebrionites*, and its large size will readily distinguish it from previously described Florissant members of the Tenebrionidæ. It probably should form a new genus, but it may belong to some living genus unknown to me.

Phyllophaga disrupta, sp. n. (Scarabæidæ).

A large brown species, but so crushed that the parts of the body cannot be described; elytra rather pale brown, evidently thin, broadly rounded at each end, the surface with numerous but not dense small punctures, irregularly arranged but running more or less in longitudinal rows; length of elytron 15 mm., width 7·5 (the same measurements in *P. extincta*, Wickham, 15 and 6·2). Wings of the general type found in the genus, but, on comparison with a living Colorado species, I find the fossil has the two branches of the media (or media and first cubitus of Tillyard) much nearer together, only about 1 mm. apart, while the structure of the anals, with a curved vein coming from a quadrate cell, is like that of *Melolontha* rather than *Phyllophaga*, though the elytra do not at all suggest *Melolontha*. The legs, so far as visible, appear to agree with *Phyllophaga*; the hind femora twice as broad as the middle ones (width of hind femora about 2·2 mm.); middle tibiæ 4 mm. long, with an apical outstanding projection, but the spurs only about half as long as the basitarsus; mid-tarsi slender, 5·5 mm. long, the joints furnished apically with bristles; the hind tibia is broadened at end as in modern forms.

Miocene of Florissant (*Geo. Sternberg*, 139 B, with reverse).

The nearest relative is the fossil *P. extincta*, which has considerably narrower elytra.

HYMENOPTERA.

Alysia phanerognatha, sp. n. (Alysiidæ).

Length about or almost 6 mm.

Robust, black, with pale ferruginous mandibles and legs (the living *A. manducator*, Panzer, is similarly black, with red legs). Wings hyaline, with ferruginous stigma and nervures; ovipositor-sheath very stout, projecting over half a millimetre beyond last tergite, but no exserted ovipositor visible. Mandibles broad, outstanding as usual in the group, the very broad truncate apex broadly but shallowly excavated, not abruptly notched; stigma large, pointed apically, the radial vein leaving it approximately at right angles, much beyond the middle; second abscissa of radius about as long as first, and hardly half as long as first intercubitus; third or apical part of radius about 850 microns long, gently curved inward, the radial cell sharply pointed at apex; basal nervure, its upper division distinct but short, in a straight line with lower, but the latter curved at lower (basad) end; first cubital cell shaped nearly as in *Pentapleura pumilio*, Nees, its ends pointed and its two lower faces subequal; second cubital cell narrow and elongated (about 640 microns long), receiving recurrent nervure a short distance from its base, and strongly angulate at that point; second intercubitus very weak, evanescent; basal nervure going about 210 microns basad of nervulus; thorax apparently rough or coarsely sculptured; abdomen sessile.

Miocene shales of Florissant (*Geo. Sternberg*).

The Alysiidæ are very remarkable for the broad flattened mandibles, which are usually wide open or extended after death, and are often so carried in life. It is not always possible to see this character in fossils, but it is very distinct in the present insect.

The four species of *Alysia* (sens. lat.) now known from the Florissant shales may be separated thus:—

	Yellow or pale; radial vein leaving stigma slightly before middle	*exigua*, Brues.
	At least head and thorax black or piceous....	1.
1.	Recurrent nervure reaching second cubital cell some distance from base; radial vein leaving stigma far beyond middle........	*phanerognatha*, Ckll.
	Recurrent nervure meeting first intercubitus..	2.

2. Basal nervure strongly bent; second intercubitus obsolete	*ruskii*, Ckll.
Basal nervure straight; second intercubitus well developed	*petrina*, Brues.

There is much difference of opinion as to the number of Alysiid genera to be recognized, and the above are referred to *Alysia* in the broad sense. *A. phanerognatha* runs in Ashmead's table to *Asyntactus*, but is, perhaps, nearer to *Goniarcha*, which Marshall considered a synonym of *Alysia*. Under a low power of the binocular I thought I could see a second recurrent vein, but this ghostly appearance totally disappeared under a higher magnification. Ashmead has described a genus *Lysiognatha* with this primitive character of a second recurrent, and W. A. Schulze (1912) declares that he has seen this feature as an individual aberration in *Alysia manducator*.

A. phanerognatha is represented by both impressions, only one of which shows the mandibles.

Amblyteles pealei, sp. n. (Ichneumonidæ).

Length 9·5 mm., anterior wing 5·5.

Rather slender; head and thorax black. Wings hyaline, with ferruginous lanceolate stigma and fuscous veins; first section of radial nervure conspicuously shorter than second, but much more than half its length; discocubital vein angulate at middle, but without a stump of a vein; areolet large, pallid, coming to a point above; basal nervure a short distance basad of insertion of the very oblique nervulus. Abdomen petiolate, as usual, the first segment black, with the apical part very broadly pale (certainly yellow in life), the two parallel dorsal keels extremely close together, only about 145 microns apart; segments 2 and 3 with colourless (yellow in life) apical part conspicuously broader than the basal black part; fourth with the black and yellow equal; fifth and sixth black, narrowly banded with yellow. Legs and antennæ not preserved. Ocelli large.

Miocene of Florissant, Station 13 (*Cockerell*).

Dedicated to A. C. Peale, the discoverer of the Florissant deposit.

This species is remarkable for its close resemblance, especially in the banding of the abdomen, to a group of living species, especially *A. flavizonatus* (Cresson), to which it appears to run in Cresson's table. The dorsum of the mesothorax has been partly destroyed, and, although I can see that it was punctured as in Cresson's species, I cannot be quite sure it was not spotted. A peculiar feature is the areolet contracted to a point above, but this condition is approached in the living *A. acerbus* (Cress.), and can be seen in the European *A. vadatorius*, Illig. In the table of Florissant fossil species by Brues (1910) it runs to *I. decrepitus*, Brues, which has only narrow light bands on abdomen. Otherwise it falls near *A. torpefactus*, Brues, which has a banded abdomen, but the areolet has a broad face above.

This species adds one more to the now long series of fossils showing the early origin of a colour-pattern persisting to to-day.

HETEROPTERA.

Being dissatisfied with my treatment of two of the Gurnet Bay (Oligocene) species, I asked Mr. W. E. China to look at the types. This he very kindly did, and reports as follows :—

Lygæites amabilis, Cockerell, 1921.

"This portion of hemelytron not only belongs to the Lygæidæ, but to the subfamily Aphaninæ. Any determination beyond this would be pure speculation, for, as regards venation and puncturation, there are at least half a dozen modern genera into which the fossil fragment would fit equally well. The colour-markings of the corium shown in your figure are, I consider, unreliable as a guide to the original colouring of the insect, having been produced by the disappearance in places of the residual brown chitinous matter due to damage caused in the cleavage of the piece of marl. The chief clue to relationships lies in the breadth of the membrane in comparison with the length of the hemelytron."

Pentatomites acourti (Cockerell, 1921).

Described as *Lygæites acourti.*

"I consider that this is a Pentatomid. The venation of the membrane excludes it from the Lygæidæ, and confines it to either the Coreidæ or Pentatomidæ. The large broad scutellum, with its characteristic puncturation, and the strong convexity of the body as a whole at once suggested a Pentatomid to me. Careful cleaning of the specimen at the side of the pronotum revealed the remains of the base of the corium and the frena, so that it seems extremely likely that this is not only a Pentatomid, but belongs to the subfamily Pentatominæ. Beyond this, it would be useless to speculate as to the relationships of the specimen."

According to a sketch sent by Mr. China, the median pale spot is really at the apex of the long scutellum, as is so common in Pentatomidæ.

In the Florissant Miocene the Lygæidæ are represented by twenty-three genera, of which seventeen are considered to be extinct. In the same beds the Pentatomidæ (s. lat.) have sixteen genera, fourteen regarded as extinct. Two of the Pentatomid genera were described by Kirkaldy (1910); all the other extinct genera were named by Scudder. The Gurnet Bay fossils, being considerably older, might be expected to fall in extinct genera, but it is evident that the whole subject needs revision by specialists in Hemiptera. While it may not be possible, as a rule, to place fossil Heteroptera in restricted modern genera, the special diagnostic features of which are not preserved, there is another important aspect of the matter. The hemipterist may well ask, Can these insects be definitely excluded from all modern genera? The answer to this question involves many close comparisons, with a large collection available. Scudder held that the Florissant Pentatomidæ, as a whole, differed from the ordinary living species by the shorter scutellum, almost always without the produced apical lobe. This would evidently be a primitive character. He found it equally true of the Cydnidæ, which he included as a subfamily of Pentatomidæ, the four genera being included in the above-quoted statistics. Now, if this contention of Scudder's can be confirmed by new studies, and other instances of evolutionary trends brought forward, we have results of considerable biological significance.

MIOCORIS, gen nov. (Reduviidæ).

Rather slender, of moderate size, with the general aspect of *Zelus*, agreeing in the absence of lateral thoracic spines, the broadened abdomen, and the long finely hairy legs; differing in the short first antennal joint (a character of the fossil *Poliosphageus* of Kirkaldy), the much stouter anterior femora, and the less elongate head. Head elongate, with a well-marked neck (as in *Zelus*), anteriorly produced to a broader angle than in *Zelus*, the portion before the eyes, both at sides and apex, with short dark spiniform bristles (style of *Opisthoplatys*); eyes prominent; sides of thorax with short dark spiniform bristles (stouter than those on legs), like those of head; thorax anteriorly angulate on each side as in *Zelus*; areole of membrane very large, pointed, longer than in

Zelus; first antennal joint not quite as long as head (much as *Opisthoplatys*); second slender, about twice as long as first; rest of antenna very slender and tapering, about as long as second joint; hairs of antennæ sparse and very short, in no case as broad as the joint; legs long and slender, sparsely clothed with very short hairs; femora unarmed, anterior femora rather stout.

Miocoris fagi, sp. n.

Length (front of head to end of membrane) 12 mm.; width of head 1·2 mm., of thorax 3 mm.; first antennal joint about 1·5 mm. long, dark at tip; second about 3 mm.; anterior femora about 3·2 mm. long; hind femora about 6 mm., hind tibiæ the same.

Dark brown, with very pale legs.

Miocene of Florissant, Colorado (*Sternberg*, 99 B). It is about 15 mm. from a leaf of *Fagus longifolia* (Lesq.).

This is the fourth species of Reduviidæ from Florissant, all belonging to different extinct genera. Scudder remarks on the comparative scarcity of this family in American Tertiary deposits, and even to-day it appears to be dominant in the Oriental and Australian regions, where it probably originated.

Gerris protobutes, sp. n. (Gerridæ).

Similar to modern species; brown; body of usual form (abdomen missing); frontal angle of head broad, about a right angle; first antennal joint 3 mm.; length of head and thorax about 8 mm., width of thorax about 2 mm.; measurements of legs in mm.: anterior femur 3·5, its tibia 3; middle femur 8, its tibia 6; hind femur 7·4.

Miocene of Florissant, Colorado (*Sternberg*, 73).

A very ordinary species, which differs from Scudder's extinct genus *Telmatrechus* by having the tibiæ conspicuously shorter than the femora. Among modern species it falls near the common *G. marginatus*, Say.

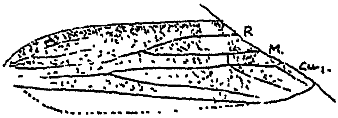
HOMOPTERA.

Cercopis amaguensis, sp. n. (Cercopidæ). (Fig. 1.)

Tegmen as preserved (apex missing) 14·5 mm., probable original length 16 mm.; width (clavus missing) about 4 mm.

Brown, suffusedly darker in the costal field, with a rather narrow (width about 1·3 mm.) pale transverse band about 10 mm. from base; costa strongly arched basally, the broad costal field near the base showing a distinct though delicate forked vein; radius and media separating about 7·3 mm. from base; cubitus forking earlier, its upper branch toward apex emitting at least two oblique branches on lower side, the vein beyond the last branch deflected upward.

Fig. 1.



Cercopis amaguensis, sp. n.

Tertiary, Kudia River, Siberia (*Cockerell*, 1923).

This was not described sooner because only a small part was exposed, but recently I managed to chip it out. The generic name *Cercopis* is here used in a broad sense, following Scudder. The appearance of the tegmen is that of the living Oriental *Cosmoscarta*, and presumably the insect is ancestral to that group. The costal margin is more rounded toward the base than in *Aphrophora protocalla*, Ckll.

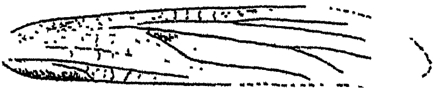
ORTHOPTERA.

Tryxalis (s. lat.) *kudiana*, sp. n. (Acrididæ). (Fig. 2.)

Tegmen long and narrow, as preserved 17 mm. long, but the apex is missing, and it was doubtless over 20 mm.; width about middle 3·3 mm.

Rather dilute brown, the nervures darker; a prominent dusky shade along anal margin below the short anal. Anal region showing some separate cross-veins, a character suggesting Tryxalinæ rather than Œdipodinæ or Acridiinæ. Probably we have an extinct genus, but it is impossible to define it accurately without better material.

Fig. 2.



Tryxalis (s. lat.) *kudiana*, sp. n.

Tertiary of Kudia River, Siberia (*Cockerell*, 1923).

The character of this fossil was not made out until I recently chipped away some of the stone. The dusky anal marginal stripe can be seen in modern *Mermiria*, and I think the insect almost certainly belongs in Tryxalinæ.

Handlirsch cites a Radoboj fossil as having been described by Heer as *Œdipoda nigrofasciata*. This name had been earlier employed for a living species, but, as a matter of fact, Heer wrote *O. nigrofasciolata*. I intended to place the Kudia River fossil under *Œdipoda*, following the broad usage of Heer for fossils, but, on the whole, it seems better to use the name *Tryxalis*.

LXXVI.—*The Godman-Thomas Expedition to Peru.*—VI. *On Mammals from the Upper Huallaga and neighbouring Highlands.* By OLDFIELD THOMAS.

A FURTHER fine collection has been received from Mr. Hendee, obtained by him considerably to the south-east of the district previously worked—which was in the Chachapoyas region of North Peru *. The present set includes a number of specimens collected at isolated localities in the highlands, which Mr. Hendee found both expensive and unproductive, but mainly consists of the very fine results of a stay of two months at Tingo Maria, on the Huallaga, and the neighbouring Chinchavita, at an altitude of about 2000–3000 feet. Here a very fine collection, comparable with that from Yurac Yacu, was made, and includes quite a number of interesting animals and several novelties.

Of the latter, special mention may be made of the fine bush-rat (*Rhipidomys rex*), the largest of the genus, and the well-marked species *Thomasomys fraternus*, found with the superficially similar *T. ischyrus*.

The collection is particularly rich in specimens of *Marmosa*, a difficult genus of which further material is most acceptable. Mr. Hendee has now found out how to trap these animals, which had previously succeeded in eluding his efforts. Thanks to the present series, a N. Peru species previously in the Museum was enabled to be discriminated.

---

* The last paper of the present series, that on mammals from Yurac Yacu, was published in Ann. & Mag. Nat. Hist. ser. 9, vol. xix. pp. 361-375.

The localities mentioned are as follows, arranged in the order they were visited:—

Huariaca, Dept. Junin.
On the Upper Huallaga, about 25 miles N. of Cerro de Pasco. Alt. 9000′.

Acobamba, Junin.
About 45 miles N.E. of Cerro. Alt. 8000′. Pachitea drainage.

Alcas, Junin.
On the divide between Huariaca and Acobamba. Alt. 11,500′. Huallaga drainage.

Chinchavita, Huanuco.
At mouth of the Rio Chinchao, on the Huallaga, about 75 km. N.E. of Huanuco. Alt. 3000′.

Tingo Maria, Huanuco.
On the Huallaga, 70 km. N. of Chinchavita, on lat. 9° S. Alt 2000′.

Chihuangala, just west of Chinchavita. Alt. 4000′.

La Union, Huanuco.
70 km. W.N.W. of Huanuco, on the Upper Marañon. Alt. 9000′.

Llata, Huanaco.
35 km. N. of La Union, in Marañon drainage. Alt. 11,000′.

Pira, Ancachs.
Highlands near Huarez. Alt. 13,000′.

Yautan, Ancachs.
Lowlands between Huarez and coast. Alt. 1500′.

In all the collection consists of rather over three hundred specimens, belonging to fifty-two species, of which three are described as new:—

1. *Alouatta seniculus*, L.

♂. 1055; ♀. 1100, 1101. Tingo Maria, 2000′.

2. *Cebus azaræ pallidus*, Gr.

♂. 1119, 1120. Tingo Maria, 2000′.

Apparently quite the same as the Yurac Yacu *Cebus*, whether that is or is not rightly named.

[*Oreonax hendeei*, Thos.

Since my previous remarks on the peculiar *Oreonax* monkey of N. Peru were published, the skull of the baby specimen sent at the same time has been prepared. This shows the milk-dentition, which, on comparison with that of *Lagothrix*, shows so much difference in detail as to demand a reconsideration of the systematic position of *Oreonax*. All the milk-teeth are very much more bulky than those of a *Lagothrix* of about the same size; the last milk-premolar, 5·8 × 5·3 mm. in area, as compared with 4·7 × 4·6, the other teeth proportionally enlarged, and the internal cusps of the two anterior premolars much more developed. But the most tangible difference is in the upper milk-canines; these in the *Lagothrix* are small, simple, and without secondary cusps, but in *Oreonax* they are very broad, almost spatulate, and both on their anterior and posterior (or, rather, antero-internal and postero-external) edges there are prominent secondary cusplets, which give them quite a different appearance. They are also set more transversely in the jaw.

Adding these youthful differences to those already described in the adult, I now consider that *Oreonax* should be treated as a genus distinct from *Lagothrix*.]

3. *Callicebus leucometopa*, Cabr.

♂. 1106, 1107; ♀. 1102, 1103, 1108, 1126, 1127. Tingo Maria, 2000′.

This species has not hitherto been recorded from Peru, but these interesting and most welcome specimens are quite like those from Ecuador obtained by Buckley in 1879, which are practically topotypes. One example has white digits, as in Elliot's *C. subrufus*, but the more reddish body-colour of the latter distinguishes it from the grey *leucometopa*.

4. *Saimiri sciurea*, L.

♂. 1001, 1113, 1114, 1115, 1117, 1121; ♀. 1032, 1051. Tingo Maria, 2000′.

These specimens are of interest because they give a hint as to the occurrence of black lines along the sides of the crown, a character which has been frequently noted in individuals from different localities, but which I have been unable to connect either with sex or locality. In this series, however, no. 1051 has these lines well marked, all the other specimens being without them. But this individual alone has the basilar suture completely closed, the others, even if apparently adult by the size of the skull and development of the teeth, having the suture still open. The suggestion therefore arises that the coronal lines are developed in extreme old age in forms normally without them. To what extent this applies to cases where the whole crown is black remains to be seen.

The normal extension of the face-patches, the yellowish back, and less bushy tail are all as in *sciurea*, not as in the Pierrot monkey (*S. s. petrina*) of N. Peru.

5. *Aotus miconax*, Thos.

♀. 1018. Tingo Maria, 2000′.

In colour much more like *A. miconax* of Yurac Yacu than the geographically nearer *A. nigriceps* and *senex*, but, broadly speaking, on the same river-system as the first-named, and separated by mountains from the two latter.

6. *Mystax pacator*, Thos.

♂. 939 (young). Chinchavita, 3000′.

♂. 1030, 1031, 1016, 1047, 1048, 1111, 1112; ♀. 1029, 1049, 1050. Tingo Maria, 2000′.

As indicated in a previous paper, the marmoset of the Pachitea region may be distinguished from *M. devillei* by its blackish mantle.

No. 939 is quite a young specimen (head and body 145 mm.), and again shows the peculiar character described in 1914 * of having the white of the lips elongated laterally to form white moustaches, as in Gray's *M. leucogenys*, a modification that one would not have expected to be characteristic of youth.

7. *Myotis nigricans*, Wied.

Two from Chinchavita, 3000′, and nine from Tingo Maria, 2000′.

8. *Myotis chiloensis oxyotus*, Peters.

Ten skins and two in spirit. La Union, Huanuco, 9000′.

I am indebted for the determination of this bat to Dr. Glover Allen, who has been recently working at the group. This series forms a valuable accession to the collection.

9. *Promops* sp.

♂. 1125. Tingo Maria, 2000′.

---

* Ann. & Mag. Nat. Hist. (8) xiii. p. 346 (footnote).

10. *Chilonycteris rubiginosa*, Wagn.

♂. 1002; ♀. 1003. Tingo Maria, 2000′.
I may take this opportunity of noting that the allied bat commonly called *Mormops blainvillei* ought properly to be termed *Aëllo cuvieri*. Both names were given by Leach, but the *Aëllo* has priority, and no reason nowadays recognizable as valid has been given for the supersession of the earlier name by the later.

11. *Tonatia amblyotis*, Wagn.

Three skins from Chinchavita, 3000′, and six skins and a spirit-specimen from Tingo Maria, 2000′.

12. *Micronycteris megalotis*, Gray.

Nine skins and one in spirit from Chinchavita, 3000′.
Recorded by K. Andersen from L. Junin.

13. *Carollia perspicillata*, L.

♀. 1069. Tinga Maria, 2000′.
♂. 1137; ♀. 1138. Chihuangala, Huanaco, 5000′.

14. *Desmodus rotundus*, Geoff.

Two adults and three immature. Llata, Huanuco, 11,000′.

15. *Felis pajeros*, Desm.

♂. 880; ♀. 860. Huariaca, Junin, 9000′.
Presumably subsp. *garleppi*, Matsch.

16. *Tayra barbara peruana*, Tsch.

♀. 969. Chinchavita, 3000′.
♀. 1077. Tingo Maria, 2000′.
With lighter-coloured heads than the Yurac Yacu specimens.

17. *Tremarctos ornatus*, F. Cuv.

1130, 1131. Skulls (male). Chinchavita, Huanuco.
"Obtained from natives."
Two fine male skulls, which quite confirm the distinctness of the still larger *T. o. majori* of Ecuador and Merida.

18. *Sciurus* (*Urosciurus*) *tricolor*, Poepp.

♂. 1110. Tingo Maria, 2000′.

The first *Urosciurus* seen from the Upper Huallaga. The type-region of *S. tricolor* is at the lower end of that river, and there is also an example of it in the Museum from the Pachitea, Upper Ucayali. The colour-resemblance to the Middle Amazon *S. pyrrhonotus* is very striking, but the size of the skull is as in *S. tricolor*.

19. *Sciurus pyrrhinus*, Thos.

♂. 1019, 1109. Tingo Maria, Huallaga, 2000′.

20. *Sciurus ignitus irroratus*, Gr.

♂. 1052; ♀. 1104, 1105, 1118, 1122, 1124. Tingo Maria, 2000′.

21. *Nectomys apicalis*, Pet.

Five from Chinchavita and six from Tingo Maria.

22. *Oryzomys xanthæolus*, Thos.

♂. 1197, 1198, 1199, 1200; ♀. 1201. Yautan, Ancachs, 1500′.

I agree with Mr. Osgood in synonymizing *O. baroni*, Allen, with *O. xanthæolus*, nor do I even think the former a valid mountain-race, as we have specimens quite typical of it from Eten on the coast, at 10 m. altitude.

23. *Oryzomys keaysi*, All.

♂. 890, 891, 892, 893. Acobamba, Junin, 8000′.

24. *Oryzomys nitidus*, Thos.

Three from Chinchavita and twelve from Tingo Maria.

Old specimens of this species, such as no. 940, became a beautiful russet above, with sharply contrasted white-washed belly, while average adult specimens are a dull brown.

25. *Oryzomys longicaudatus destructor*, Tsch.

♂. 848, 852, 874; ♀. 847, 853, 869, 873. Huariaca, Junin, 9000′.

♂. 924. Alcas, 25 miles N.E. of the Cerro, Junin, 11,500′.

♂. 1004, 1066, 1067; ♀. 987, 988. Tingo Maria, 2000′.

The specimens from Tingo Maria are smaller, with shorter tails, and with shorter closer fur than those from the higher altitudes.

26. *Thallomyscus aurillus*, Thos.

♂. 906; ♀. 897. Acobamba, Junin, 8000′.

These are typical *Thallomyscus*, with the minute molars, shortened palatal foramina, and reduced zygomatic plate of that genus. Two other mice, nos. 873 and 874, from Huariaca, 9000′, are more puzzling, but I believe them to be delicately built immature specimens of *Oryzomys l. destructor*, such specimens having often a deceptive resemblance to *Thallomyscus*.

Or, again, it is possible that besides *destructor* there really is in this region a special small species of *Oryzomys* to which the Huariaca specimens belong, and for which the name of *minutus* might be available. But the material is too insufficient, and, owing to the fragility of the skulls, too imperfect, for this difficult question to be cleared up at pleseent.

27. *Neacomys spinosus*, Thos.

♂. 942; ♀. 973. Chinchavita, 3000′.
♂. 1094. Tingo Maria, 2000′.

28. *Rhipidomys rex*, sp. n.

♀. 970. Chinchavita, Huanuco, 3000′.

♂. 1136 (imm.); ♀. 1133 (in al.), 1134, 1135. Chihuangala, Huanuco, 4000′.

A large species, the largest of the genus, with a very long heavily pencilled tail.

Size considerably larger than in the large Peruvian species *R. lucullus* and *leucodactylus*. General colour above grizzled tawny greyish brown, the type (old) more suffused with tawny, the others (younger) more brownish. Under surface muddy greyish, the bases of the hairs slaty, their ends whitish on throat and inguinal region, dull buffy on belly, the type more strongly buffy than the others. Ears dull brown, more conspicuously darker than the general tone. Hands dull whitish, with darker metacarpals. Hind feet large, blackish, as usual, along the middle area of the metatarsals, whitish along their edges and on the digits. Tail very long and thick, heavily clothed with black hairs, which in the old specimen may attain terminally nearly 20 mm. in length.

In the younger specimen the scales are visible proximally through the hairs.

Skull large and heavily built, of the usual proportions.

Dimensions of the type (an old female):—

Head and body 211 mm.; tail 266; hind foot 39; ear 22.

Skull: greatest length 46; condylo-incisive length 44; zygomatic breadth 25; nasals 16·5; interorbital breadth 7; mastoid breadth 17·2; zygomatic plate 3·9; palatilar length 19·8; palatal foramina 9·5 × 4; upper molar series 7·1.

Hab. as above. Type from Chinchavita, 3000′.

Type. Old female. B.M. no. 27. 11. 1. 125. Original number 970. Collected 25th December, 1926.

"Trapped in abandoned house; seen climbing on rafters at night."—*R. W. H.*

A very fine and distinct species, readily recognizable by its large size and handsome, well-haired, black tail.

29. *Rhipidomys lucullus*, Thos.

♀. 975. Chinchavita, Huanuco, 3000′.

Rather smaller than the type, which came from Garita del Sol, Vitoc, 5740′.

30. *Œcomys osgoodi*, Thos.

♂. 1065, 1078, 1079, 1084; ♀. 1058, 1116 (in al.), 1128 (in al.). Tinga Maria, 2000′.

A very interesting and instructive series, showing an unexpected amount of variability in size and in the coloration of the underparts. The skulls range in length from 33·3 to 36 mm., and the hind feet from 26·5 to 29 mm. The palatal foramina also vary considerably, but the molars are quite uniform in size, falling much short of those of *Œ. superans*. In colour one specimen is completely soiled buffy below, like the type of *osgoodi*, one has the under surface white as in the type of *palmeri*, the hairs, however, slaty-based as usual, and the other two are intermediate. On the other hand, the fur in *palmeri* is decidedly more woolly, less sleek and glossy, than in *osgoodi*, and the ears are shorter, 15 mm. as compared with 17–19 in the southern form. This latter character may prove to represent a real difference between the two, and I therefore now use the name geographically most pertinent. The type of *osgoodi* came from Moyobamba, those of *palmeri* and *superans* from Canelos in Eastern Ecuador.

31. *Phyllotis darwini posticalis*, Thos.

Nine from Huariaca, Junin, 7000′; five from Llata, Huanuco, 11,000′; five from La Union, Huanuco, 9000′; and two from Pina, Ancachs, 13,000′.

Seems widely distributed over the highlands of Central Peru. The Huariaca specimens are coloured quite like the type, which came from Galera, south-west of Oroya, except that their under surface has a greater tendency towards buffy. None of these pericotes have any indication of the peculiar coloration of the incisors found in *P. abrocodon*, discovered by Mr. Hendee at Oroya.

32. *Hesperomys frida miurus*, Thos.

♂. 864, 871, 881; ♀. 872. Huariaca, 9000′.

♂. 914, 922; ♀. 915. Alcas, 25 miles N.E. of Cerro, Junin, 11,500′.

33. *Thomasomys ischyrus*, Osg.

♂. 886, 887, 901, 902, 903; ♀. 885, 888, 889, 894. Acobamba, 45 miles N.E. of Cerro, Junin, 8000′.

34. *Thomasomys fraternus*, sp. n.

♂. 916, 917, 927, 928; ♀. 923. Alcas, 25 miles N.E. of Cerro, Junin. 11,500′.

A medium-sized species, externally very similar to *T. ischyrus*, but smaller and with more proodont incisors and smaller molars.

General external appearance very much as in *T. ischyrus*, with the same soft woolly fur (hairs about 12 mm. on the back) and of the same warm brown colour. But the size is not so great and the tail is markedly shorter. Belly washed with buffy. Ears of average size, black. Hands and feet dull white. Tail quite short-haired, finely scaled, brown above and below.

Skull more delicately built than in *ischyrus*, with narrower brain-case and long narrow muzzle. Nasals long and narrow; interorbital region smoothly rounded; zygomatic plate comparatively narrow, slanted backwards above; zygomata little expanded, thin and thread-like; palatal foramina medium; bullæ small.

Upper incisors resembling those of *T. daphne* in being comparatively proodont (index of type 82°). Molars much smaller than in *ischyrus*—in fact, little exceeding those of *daphne*.

Dimensions of the type:—

Head and body 174 mm.; tail 125; hind foot 25·5; ear 17·5.

Skull: greatest length 31·4; condylo-incisive length 28·2; zygomatic breadth 15; nasals 13×3·7; interorbital breadth 5·2; breadth of brain-case 14; zygomatic plate 2·2; palatilar length 12·8; palatine foramina 6·2; bullæ (antero-posterior length) 4·6; upper molar series 5; breadth of m^1 1·5.

Hab. as above.

Type. Old male (teeth much worn). B.M. no. 27.11.1.169. Original number 916. Collected 25th November, 1926.

"Trapped under rocks in brush."

This species is very distinct from any known to me. Its external resemblance to *T. ischyrus* is contradicted by its very different skull, whose long narrow muzzle, narrow zygomatic plate, small molars, and, especially, its proodont incisors readily distinguish it. *T. daphne*, the only other species with such incisors, has quite a short muzzle, as may be seen by its published skull-measurements.

35. *Akodon ærosus*, Thos.

♂. 1053, 1092, 1093; ♀. 1010, 1027, 1028, 1070, 1091. Tingo Maria, 2000′.

36. *Akodon mollis altorum*, Thos.

Thirteen from Huariaca, 9000′; six from Acobamba, 45 miles N.E. of Cerro, 8000′; eight from Alcas, 25 miles N.E. of Cerro, 11,500′; ten from La Union, Huanuco, 9000′; and seven from Llata, Huanuco, 11,000′.

As usual, common in every locality in the highlands, while at the lower and more tropical Tingo Maria *A. ærosus* seems to take its place.

The Acobamba specimens average darker coloured and rather longer tailed than the rest, but not sufficiently so to render distinction justifiable.

No cases of the "*Microxus*" form of zygomatic plate occur in this series.

37. *Akodon puer*, Thos.

♂. 1166 (immature). La Union, Huanuco, 9000′.

38. *Proechimys pachita*, Thos.

Eleven from Chinchavita and ten from Tingo Maria.

As usual in this difficult genus the skulls of these specimens vary considerably, but the majority have the long palatal foramina of the Pachitea animal, not the short ones of *P. simonsi*. One specimen (no. 930) is abnormally small, and its foramina are shorter than usual, but this may be considered as merely an individual variation.

In colour most of the specimens have the under surface wholly white, but in five the chin and throat are buffy, several have a buffy line down the sides of the belly, and a number have the front of the thighs buffy; this latter is the case in the representative paratype of *P. pachita*. None have the almost wholly buffy under surface of the type of *P. brevicauda*, which came from Chamicuros, further down the Huallaga.

39. *Dactylomys* (*Lachnomys*) *peruanus*, All.

♀. 907 (young). Acobamba, Junin, 8000′.

Additional material of this remarkable species is very welcome. Even now we have not an adult specimen of it.

40. *Lagidium inca*, Thos.

♂. 1191, 1192, 1193, 1194; ♀. 1188, 1189, 1190. Pira, Ancachs. 13,000′.

41. *Cœlogenys paca*, L.

909, 910 (skulls. imm.). Acobamba, Junin, 8000′.
1139 (skull, ♂). Chihuangala, Huanuco, 4000′.
"Secured from natives."

42. *Cavia tschudii festina*, subsp. n.

♂. 861. Huariaca, Junin, 9000′.

Like *C. t. tschudii*, but larger, or, at least, with much longer skull.

General appearance very much as in the Cuzco specimens of *tschudii* accepted as representing that form, or the colour may be a little more intense, the buffy rings on the hairs more ochraceous, the chin, chest, and belly rich ochraceous buffy, the collar below neck well marked, brown.

Skull larger—that is, longer—than in any described cavy from this region, though that of *C. t. stolida* is more bulky. The type-skull is 69 mm. in length, while of a series of *tschudii* skulls the longest is 62 mm., and in a decidedly older, indeed aged, skull of *C. t. umbrata* it is 63 mm. Muzzle long, parallel-sided, not nearly so broad as in *stolida*, the nasals ending squarely behind. Palatal foramina narrow. Bullæ very small, 10·5 mm. in length. Molars comparatively small, as may be gauged by the hinder breadth of m^1 being only 3·5 mm.

Dimensions of the type:—

Head and body 272 mm.; hind foot 47; ear 26.

Skull: greatest length 68; condylo-incisive length 61; zygomatic breadth 37·5; nasals 24·5 × 9; interorbital breadth (exclusive of notch) 14; mastoid breadth 23; palatilar length 30·7; palatal foramina 7; bulla 10·5; upper cheek-teeth (crowns) 14.

Hab. as above.

Type. Adult male. B.M. no. 27.11.1.230. Original number 861. Collected 15th October, 1926.

"Shot in a peculiar patch of brush on steep hill-side."—*R. W. H.*

Distinguishable by the great size of the skull, the small bullæ, and intense coloration.

43. *Sylvilagus defilippii*, Corn.

♂. 1021, 1059, 1076. Tingo Maria, 2000′.

44. *Tapirus terrestris*, L.

♂. 1056 (skull). Tingo Maria.

"Shot in forest. Common."—*R. W. H.*

45. *Dicotyles tajaçu*, L.

1132 (skull). Chinchavita, 3000′.

46. *Tatu pilosa*, Fitz.

911. Acobamba, Junin, 8000′.

Secured from natives; no skull.

A very rare species, of which only three or four specimens have been previously recorded. An example, now in the Museum, was mentioned by Flower in 1894 *, and a previous one, belonging to the Scarborough Museum, in 1886 †. The present individual is larger than either, but is clearly referable to the same form.

---

* P. Z. S. 1894, p. 655.

† *Ibid.* 1886, p. 419.

47. *Metachirus opossum canus*, Osg.

♂. 1080, 1083; ♀. 1090 (in spirit). Tingo Maria, 2000′.

48. *Metachirus nudicaudatus tschudii*, All.

♂. 943, 965; ♀. 932, 933, 934. Chinchavita, 3000′.
♂. 1034; ♀. 1322. Tingo Maria, 2000′.

In this series the dark dorsal line is always present, and in two examples is so expanded as to cover practically the whole breadth of the back.

The specimens with reduced dorsal line are quite like those from Yurac Yacu representing *M. n. tschudii*, while those with the more heavily blackened back tend towards the *M. n. infuscus* of the Inambari.

49. *Marmosa germana*, Thos.

♀. 971, 977, 980, 1129 (in alcohol). Chinchavita, Huanuco, 3000′.

All very strongly suffused with yellowish below, the mammary region ochraceous tawny.

A well-developed female in spirit has 4—1—4 = 9 mammæ.

50. *Marmosa noctivaga*, Tsch.

♂. 974; ♀. 966, 976. Chinchavita, 3000′.
♂. 995, 1045, 1054, 1061, 1074, 1075, 1082, 1085, 1086, 1098; ♀. 1007, 1035, 1057, 1088, 1089. Tingo Maria, 2000′.

Averaging rather darker above than typical *noctivaga*, and thus tending towards the subspecies *lugenda*, which I described from Yurac Yacu.

Below these specimens are unusually variable, the light area along the centre of the belly expanding in some to cover the whole under surface; the light colour itself either white or buffy, sometimes quite strong buffy. In fact, the definite buffy occurring in two specimens renders rather doubtful the use of this character in Osgood's *M. impavida neglecta* from Yurimaguas.

I may take this opportunity of recording that, by the great kindness of Dr. Fuhrmann, of Neuchâtel, I have been enabled to examine the type-specimen of Tschudi's *Didelphys noctivaga*, and find that the Chanchamayo and Marcapata specimens we have named as *noctivaga* are rightly so determined. The type-skull has exactly the same parallel, slender, sharply defined supraorbital ridges, quite distinct, but without projecting angular processes, that occur in what we have called *noctivaga*. It is an old individual, so that a certain slight superiority in size is readily accounted for.

As to Tschudi's *D. impavida*, unfortunately no example is now in the Neuchâtel Museum, nor was in 1902, when I saw the collection. But there is a specimen which was labelled there as a young *noctivaga*, but is really an adult *M. quichua* or *musicola*. This cannot be the type of *impavida*, as might have been supposed, for it does not agree with the description of that animal either in colour or dimensions, and is a male, while Tschudi mentions a female. It has the characteristic grey-based belly-hairs of *quichua*, while *impavida* is described and figured as having its underside white; its trunk is barely 5 inches long and its tail 4½, as compared with the 6″ 3‴ and 5″ 4‴ of Tschudi's *impavida*.

Probably *impavida* had best be considered as a synonym of *noctivaga*, from which Tschudi gives no essential distinctions, and which has not infrequently a white or whitish belly. It *may* have been based on a specimen of *musicola*, with which its tail-colour agrees, but this is so uncertain that I would not at present adjust the names of the species to suit that supposition.

Furthermore, I may note that the specimen referred to *M. noctivaga* in the second paper of the present series *, from Tambo Carrizal, proves to be a different animal now that we have a good set of *M. noctivaga* for comparison with it. And three other similar specimens had previously been obtained by Mr. Rutter. It may be called

Marmosa leucastra, sp. n.

Size less than in *noctivaga*. General colour above very pale greyish buffy, very much as in the *M. simonsi* of Puna Island, much paler than in any of the forms hitherto described from Peru. Under surface wholly whitish, not very sharply defined laterally, the hairs white to their bases. Eye-rings very slightly indicated, markedly less conspicuous than in *musicola* or *madescens*. Tail only dark proximally above, the terminal two-thirds and whole of lower surface quite white.

Skull smaller than in *noctivaga*, but of the same general character; narrow, the zygomata little expanded; supraorbital edges with fine parallel beads, not developing angular processes.

---

* Ann. & Mag. Nat. Hist. (9) xvii. p. 616 (1926).

Dimensions of the type:—

Head and body 114 mm.; tail 170; hind foot 18·5; ear 23.

Skull: greatest length 34; condylo-basal length 33; zygomatic breadth 17·3; nasals 14 × 4; interorbital breadth 6; breadth of brain-case 12·7; front of canine to back of m^1 14·3; combined lengths of ms^{1-3} 6.

A Chachapoyas specimen is rather larger, with skull-length 36·2 mm.

Hab. Province of Amazonas, N. Peru. Type from Tambo Carrizal, about 40 miles south of Chachapoyas. Alt. about 9000′. Other specimens from Chachapoyas itself, 7500′.

Type. Adult male. B.M. no. 26. 4. 1. 102. Original number 196. Collected 6th September, 1925, by R. W. Hendee on the Godman-Thomas Expedition. Four specimens examined.

This species may be distinguished by its pale greyish general colour, its broadly white under surface, white-ended tail, and, notably, the nearly complete absence of black eye-rings. The interorbital region of the skull is essentially as in *M. noctivaga.*

51. *Marmosa quichua musicola*, Osg.

♀. 935. Chinchavita, 3000′.

♂. 1036, 1073, 1081, 1097; ♀. 1072, 1087. Tingo Maria, 2000′.

As suggested in the last paper, Osgood's *musicola* proves to be so closely allied to the Cuzco *quichua* that I now think it best to unite the two specifically, while leaving the brown-tailed form as a separate subspecies. But there is sufficient variation in the tail-coloration to make even this course a little doubtful.

52. *Marmosa marica*, Thos.

♂. 1063; ♀. 1064. Tingo Maria, 2000′.

An interesting and most unexpected discovery, no Marmosas of the *pusilla* type having hitherto been found in Peru. The type-locality of *M. marica* is Merida, Venezuela, whence we have a fair number of specimens, and from these I can find no means of distinguishing Mr. Hendee's Tingo Maria examples.

The relationship to *M. pusilla* itself is also no doubt very close.

LXXVII.—*An Abnormal Specimen of* Rana temporaria (♂).

By C. R. White-Thomson, B.A., F.Z.S..

The specimen in question was caught at Eton, and used for dissection in the ordinary way, during the month of June. Externally there was nothing remarkable about the frog, which was a medium-sized male, but, when opened, certain peculiarities in the vascular system were instantly noticeable.

Foremost among these was a large and conspicuous vein running across the throat and springing from the external jugular (*Ex.j.*) of the left side. In view of this obvious abnormality, I gave the frog to my pupil, Mr. H. R. N. Rickett, who carried out the remainder of the dissection and made the necessary diagrams.

Further investigation brought to light the following peculiarities:—The innominate and subclavian veins from the left anterior vena cava were normal, but the external jugular gave off the large cross-connection already mentioned, which appeared to form the principal vessel on the right side. Anterior to this cross-connection the left external jugular broke up into the lingual (*l.v.*) and mandibular (*m.v.*) veins. The latter appeared to arise as a double vein, and to run throughout its course as such, though, owing to its small size, it was difficult to be quite positive on this point.

There were few peculiarities in the arterial system of the left side, though, as the diagram shows, the lingual artery (*l.a.*) was somewhat misplaced, and several small branches were seen which were not present in the lingual artery of the opposite side.

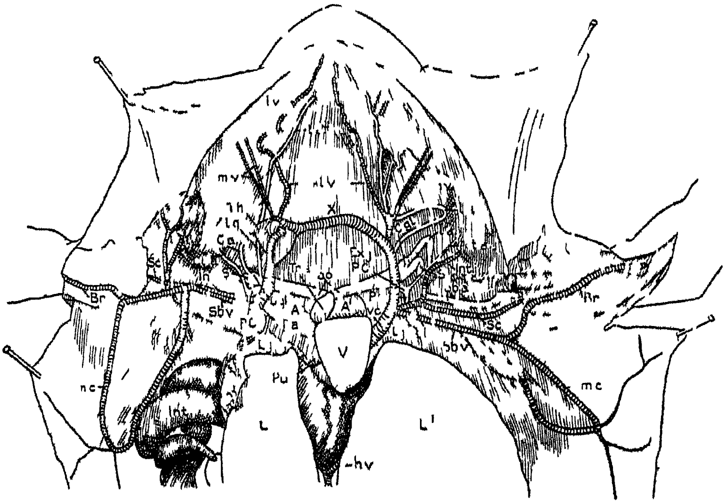
The left lung was small, but otherwise normal, as were the thyroid and thymus glands.

On the right side there were several remarkable abnormalities, the chief of these being the complete absence of a right vena cava to the heart. All the large venous trunks on this side opened into the cross-connection from the external jugular of the left side already mentioned. The venous blood on the right side, therefore, passed ultimately into the right auricle by way of the left anterior vena cava.

The right subclavian and innominate veins were normal, though from the former sprang a minute vein which ran towards the heart in the position normally occupied by the right anterior vena cava. This vessel was, however, abortive, and did not reach the heart.

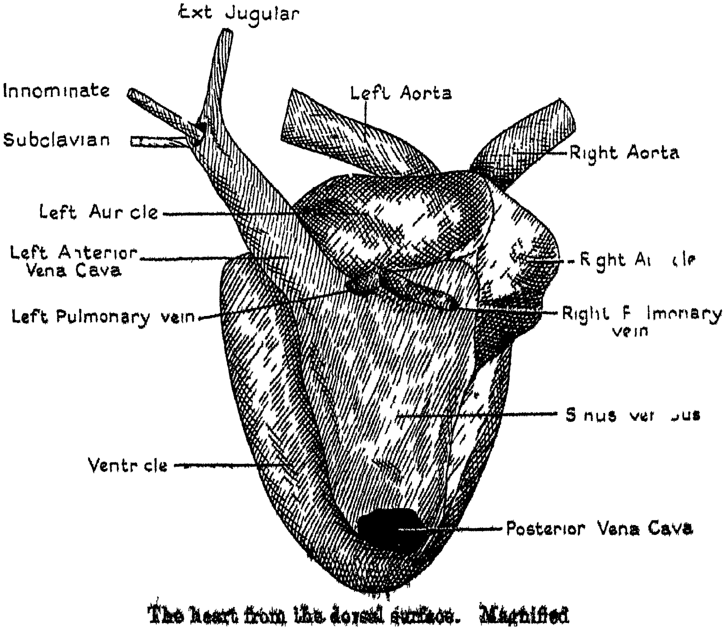
As the diagram shows, the right external jugular was

Fig 1



General view of blood-vessels About normal size

Fig 2



The heart from the dorsal surface. Magnified incorporated in the peculiar connection from the left side, and gave off lingual and mandibular veins.

Here, again, the mandibular vein was found to be double.

The arterial system on the right side presented few interesting features, though the subclavian artery was unusually small.

The right thyroid gland and right lung were unusually large, the latter containing nine specimens of *Rhabdonema nigrovenosum*.

The second diagram is of the heart viewed from the dorsal side, showing the absence of a right vena cava. In the first diagram the veins are shaded and the arteries left white, while the cross-connection referred to above is marked ×.

Key to Diagrams.

A'=right auricle.
A''=left auricle.
ao.=aorta.
Br.=brachial vein.
C.a.=carotid artery.
c.gl.=carotid gland.
Ct.a.=cutaneous artery.
Ex.j.=external jugular.
h.v.=hepatic vein.
In.=innominate vein.
Int.=intestine.
Int.j.=internal jugular.
L'=right lobe of liver.
L''=left lobe of liver.
l.a.=lingual artery.
Lg'=right lung.
Lg''=left lung.
l.v.=lingual vein.
m.c.=musculo-cutaneous.
m.v.=mandibular vein.
P.a.=pulmonary artery.
P.C.=pulmo-cutaneous.
P.v.=pulmonary vein.
S.=systemic arch.
Sb.a.=subclavian artery.
Sb.v.=subclavian vein.
Sc.=subscapular.
S.v.=sinus venosus.
Th.=thyroid gland.
Tr.a.=truncus arteriosus.
V.=ventricle.
vc'=anterior vena cava.
vc''=posterior vena cava.

LXXVIII.—*A new Species of Trematode from* Mabuia dissimilis. By G. D. Bhalerao, M.Sc., Professor of Zoology, Hislop College, Nagpur, C.P., India.

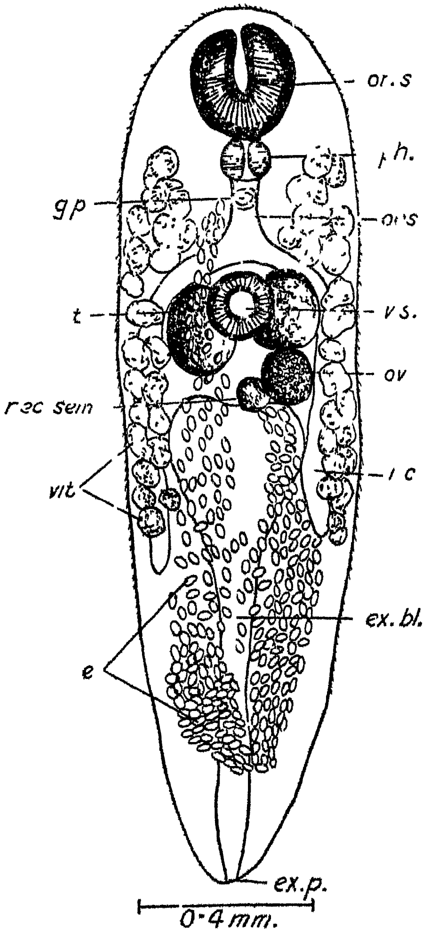
Through the courtesy of Prof. F. J. Meggitt I got the opportunity of examining these worms, which he had obtained in large number from the intestine of a lizard—*Mabuia dissimilis*—from Rangoon. The worms are elliptical, broad at the anterior end, tapering gradually posteriorly. They measure 1·07–2·11 mm. in length and 0·24–0·53 mm. in breadth. The cuticle is very thin, transparent, and beset with fine backwardly directed spines.

The oral sucker is subterminal, measuring about 0·22 ×

0·2 mm. The ventral sucker is situated at one-third the distance of the body from the anterior end, and is circular, measuring about 0·13 mm. in diameter. The ratio between the size of the two suckers is 3 : 2. The pharynx is short, muscular, and measures 0·07 × 0·1 mm. The œsophagus is of moderate length. The intestinal cæca are simple and pass posteriorly along the sides of the body, and terminate much in front of the posterior end. The excretory pore is situated at the posterior end of the body. It leads into a simple bladder, which extends anteriorly to a short distance behind the ovary, where it bifurcates into two short arms which diverge towards the sides of the body. On the dorsal side of the pharynx is seen a short stout nervous band, which gives two short branches anteriorly and two somewhat long branches posteriorly. At the sides of the band are observed short nerves that pass towards the sides of the body.

The testes are two round to oval bodies, measuring 0·16–0·18 × 0·13–0·14 mm. They are situated on the dorsal side of the ventral sucker and are almost symmetrical. The majority of specimens have the right testis slightly in advance. The vasa efferentia arise from their anterior ends and meet centrally to form a short common duct—the vas deferens. The cirrus-sac is small and is situated centrally a short distance in front of the ventral sucker; more than one-third of its length is occupied by the vesicula seminalis. The pars prostatica and the ductus ejaculatorius are very small. The genital pore is situated a short distance behind the pharynx, ventral to the œsophagus.

The ovary is a small round body situated behind the right testis and measuring 0·11 × 0·095 mm. Situated posteriorly to the ovary is a small round receptaculum seminis, measuring 0·06 mm. in diameter. The shell-gland is situated in the middle line a short distance behind the receptaculum seminis. Laurer's canal is small. The uterus appears to arise from the shell-gland, and passes anteriorly to the right side as far as the ovary. It then passes posteriorly and coils itself on the right side of the body, after which the coils pass towards the left side anteriorly as far as the hinder end of the left testis, sometimes overlapping the latter. Its terminal portion passes on the dorsal side of the ventral sucker, and opens to the exterior by means of the genital pore. The vitellaria consist of small rounded follicles and vary considerably in their extent in different specimens. Two short stout vitelline ducts are seen posterior to the shell-gland. The uterus is filled with two kinds of ova—small, rounded, thin-shelled ones in its posterior portion, and in the anterior coils oval eggs with yellowish-brown shell, operculated at one end. They measure 0·034–0·037 × 0·023–0·026 mm.



Mesocœlium meggitti, sp. n.

e., eggs; *ex.bl.*, excretory bladder; *ex.p.*, excretory pore; *g.p.*, genital pore; *i.c.*, intestinal cæca; *oes*, œsophagus; *or.s.*, oral sucker; *ov.*, ovary; *ph.*, pharynx; *rec.sem.*, receptaculum seminis; *t.*, testis; *v.s.*, ventral sucker; *vit.*, vitellaria.

The genus *Mesocœlium* was proposed by Odhner (1911) for the species from *Bufo melanostictus* described by Lühe

(1901) as *Distomum sociale.* After that Johnston (1912) added three new species—*M. mesembrium*, *M. megaloon*, and *M. oligoon.* Nicoll described (1914) *M. microon* from the duodenum of *Hyla cæcilea.* André (1915) described *M. carli*, and, lastly, Skrjabin added (1922) a species from the intestine of *Chamæleon* which he named *M. sokolwi.* Of these the last one appears to be wrongly included in the genus *Mesocœlium.* The important features of this genus are (1) the shortness of the intestinal cæca, and (2) the extension of the vitellaria anterior to the intestinal fork. The species of Skrjabin, however, has the intestinal limbs extending as far as the posterior end of the body, the alimentary canal is without œsophagus, the vitellaria are situated only posterior to the testes, and the greatest broadth is at the level of the ovary. With these characteristics it cannot be accommodated in the genus *Mesocœlium* ; the genus in which it can be fitted in most appropriately is *Platynosomum*, Looss, 1907, and *M. sokolwi* should become *Platynosomum sokolwi* (Skrjabin, 1922). Out of the remaining six species the present one agrees best with *M. microon*, Nicoll, 1914. The points of agreement are the general dimensions of the body, the ratio of the suckers, the lengths of the intestinal cæca, and the extension of the vitellaria ; it differs, however, in the shape of the body, in having the right testis in advance instead of the left, the ovary situated to the right of the middle line instead of to the left, the receptaculum seminis close to the ovary instead of being far removed, and in the host being a reptile instead of an amphibian. These points being of sufficient importance to justify the creation of a new species, I propose the name *Mesocœlium meggitti* for it, in honour of Professor Meggitt, who kindly placed the specimens at my disposal.

Specific Diagnosis.—*Mesocœlium.* Body broad anteriorly and tapering posteriorly. Cuticle beset with spines. The ratio of the suckers 2 : 3. Intestinal cæca extending from a half to seven-elevenths of the total length of the body. Testes at the sides of ventral sucker, the right slightly in advance. Cirrus-sac not reaching ventral sucker. Ovary on the right side of the middle line. The extent of the vitellaria variable. Receptaculum seminis close to ovary. Eggs dimorphic, operculated, 0·034–0·037 × 0·023–0·26 mm.

Host. *Mabuia dissimilis.*

Loc. Rangoon.

References.

André, E. (1915.) "*Mesocœlium carli*, Trematode parasite d'une tortue africaine." Rev. Suisse Zool. Genève, xxiii. pp. 91–93.

Johnston, S. J. (1912.) "On some Trematode Parasites of Australian Frogs." Proc. Linn. Soc. N.S.W. xxxvii. pp. 285–362.

Lühe, M. (1901.) "Zwei neue Distomen aus indischen Anura." Centralbl. Bakt. xxx. pp. 166–177.

Nicoll, W. (1914.) "The Trematode Parasites of North Queensland. —I." Parasitol. vi. pp. 333–350.

Odhner, T. (1911.) "Nordostafrikanische Trematoden grösstenteils vom Weissen Nil (von der Swedischen Zoologischen Expedition gesammelt)." Res. Swedish Zool. Exped. to Egypt, 1907, pt. 4, no. 23 A, pp. 1–166.

Skrjabin, K. I. (1922.) 'Parasitic Trematodes and Nematodes collected by the Expedition of Prof. V. Dogiel and I. Sokolv in British East Africa and Uganda,' pp. 99–157.

LXXIX.—*On the Families and Genera of the Class Echiuroidea.* By C. C. A. Monro.

(Published by permission of the Trustees of the British Museum.)

There have been, since 1900, several generic revisions of the Echiuroidea—notably that of *Echiurus* by Spengel in 1912 and of *Thalassema* by Wharton in 1913,—but no attempt has of recent years been made at a general systematic arrangement of the class as a whole. Lankester, in 1883, made a detailed comparison of the genera *Hamingia*, *Bonellia*, and *Thalassema*, and Rietsch, in 1886, published a general survey of the group. Within the last twenty-five years a number of new forms have been described, having characters which transcend the accepted limits of the old genera, and even of the families, to which, with admirable economy, they are assigned.

Thus, the presence of a blood-system, of anal glands, and of a collateral intestine or siphon were regarded as characters common to the whole class; but *Urechis* is without a vascular system and *Hamingia sibogæ*, Sluiter, has neither collateral intestine nor anal glands. Paired ventral hooks, a single unpaired uterus, and a bifid proboscis were accepted as characteristic of the Bonelliidæ, but Ikeda has described a *Bonellia* with no ventral hooks, *Pseudobonellia* of Johnston and Tiegs has two functional uteri, and *Protobonellia*, Ikeda, has an undivided proboscis.

Similarly, Lankester, in his summary of the generic characters of *Thalassema*, gives the number of nephridial openings as four or six, but *Thalassema tænioides*, Ikeda, has over two hundred. Therefore a rearrangement and redefinition of the existing families and genera seem to be needed, and I propose the following classification:—

Class ECHIUROIDEA.

Exclusively marine animals, usually of moderate size (*Ikeda*, Wharton, reaches nearly 2 metres in length), with a highly contractile preoral lobe or proboscis. A collateral intestine and anal glands are present, except in *Hamingia sibogæ*, Sluiter. There is a simple nerve-cord without ganglia, and a vascular system, except in *Urechis*, Seitz. In all except a few species there is a pair of ventral hooks. Sexes separate.

Family Echiuridæ.

Male and female similar. Proboscis simple, not bifid. Anal bristles present or absent. Ventral hooks present.

Subfamily *ECHIURINÆ.*

Proboscis long, spoon-shaped, easily autotomized. One to two pairs of nephridia. Two rings of anal bristles. Vascular system present. Internal openings of nephridia without spiral arms.

Genus ECHIURUS, Guérin-Méneville, 1831.

Genotype, *Echiurus echiurus* (Pallas), 1766.
Characters as in subfamily.

Subfamily *URECHINÆ.*

Proboscis short, collar-like, not easily autotomized. One anal bristle-ring. Nephridia with spirally twisted internal openings. No vascular system.

Genus URECHIS, Seitz, 1907.

Genotype, *Echiurus chilensis*, Max Müller, 1852.
Characters as in subfamily.

Subfamily *THALASSEMATINÆ.*

Characters.—No anal bristles. Proboscis easily autotomized.

Genus THALASSEMA, Gaertner, 1774

Genotype, *Thalassema neptuni*, Gaertner, in Pallas, 1774.
Characters.—Nephridia few, arranged in pairs or in small paired groups. Size moderate.

Genus IKEDA, Wharton, 1913.

Genotype, *Thalassema tænioides*, Ikeda, 1905.
Characters.—Nephridia exceedingly numerous, more than two hundred, unpaired. Size large.

Family **Bonelliidæ.**

Male degenerate, parasitic on female. Usually a single nephridium and paired ventral hooks. Proboscis simple or bifid.

Subfamily *PROTOBONELLIINÆ.*

Uterus single. Paired ventral hooks. Proboscis long, simple, not bifid. Internal opening of uterus with long fimbriated funnel. Anal glands once-branched.

Genus PROTOBONELLIA, Ikeda, 1908.

Genotype, *Protobonellia mitsukurii*, Ikeda, 1908.
Characters as in subfamily.

Subfamily *BONELLIINÆ.*

Proboscis bifid. Ventral hooks normally present.

Genus BONELLIA, Rolando, 1821.

Genotype, *Bonellia viridis*, Rolando, 1821.
Characters.—A single uterus. Ventral hooks present, usually one pair.

Genus ARCHIBONELLIA, Fischer, 1919.

Genotype, *Archibonellia michaelseni*, Fischer, 1919.
Characters.—An unpaired uterus and two small nephridia present. End of proboscis cleft, arms only slightly divergent.

Genus PSEUDOBONELLIA, Johnston & Tiegs, 1919.

Genotype, *Pseudobonellia biuterina*, Johnston & Tiegs, 1919.

Characters.—Two functional uteri and a male tube or androecium present.

Genus IKEDELLA, gen. nov. for *Bonellia misakensis*, Ikeda, 1905.

Characters.—Ventral hooks absent. Uterus single.

Subfamily *HAMINGIINÆ*.

Proboscis simple, not bifid. Usually two uteri. Ventral hooks either absent or, if present, lacking muscular sheath and radial muscles. Collateral intestine and anal glands present or absent.

Genus HAMINGIA, Koren & Danielssen, 1881.

Genotype, *Hamingia arctica*, Koren & Danielssen, 1881.

Characters.—No ventral hooks. Uterus opening on papilla. Anal glands and siphon present.

Genus ACANTHOHAMINGIA, Ikeda, 1910.

Genotype, *Acanthohamingia shiplei*, Ikeda, 1910.

Ventral hooks present, but lacking radial muscles and muscular sheath. No uterine papilla. Siphon and anal glands present.

Genus SLUITERINA, gen. nov. for *Hamingia sibogæ*, Sluiter, 1902.

Characters.—No ventral hooks. Siphon and anal glands absent.

Protobonellia is a transitional form between the Bonelliinæ and the Hamingiinæ. In the possession of a single uterus, paired ventral hooks, and unpapillated external genital aperture it resembles *Bonellia*, but the undivided proboscis, the thin-walled uterine pouches, and the fimbriated internal opening of that organ relate it to *Hamingia*. Fischer considers *Archibonellia*, with its paired nephridia and slightly divided proboscis, as an intermediate or ancestral form to *Bonellia* and *Thalassema*.

The variation in the number and state of development of the ventral hooks in the Bonelliidæ forms an interesting study. The normal arrangement is a pair of hooks supported by powerful muscles. In *Bonellia miyajimai*, Ikeda, their number is increased, and they are altogether absent in *Sluiterina misakiensis* (Ikeda). In *Archihamingia* they are fairly numerous, but the musculature is lacking, and we seem to have to do with an organ which is losing its function and is in the process of disappearing. In *Hamingia* they are absent altogether.

I append the following keys to the genera of the two families:—

Family Echiuridæ.

a. Two rows of anal bristles.
1. *b.* Vascular system present .... *Echiurus.*
aa. One row of anal bristles.
2. *bb.* No vascular system .... *Urechis.*
aaa. Anal bristles absent.
b. Vascular system present.
3. *c.* Nephridia few, arranged in pairs or in paired groups. Size moderate........ *Thalassema.*
4. *cc.* Nephridia exceedingly numerous, unpaired. Size large.................. *Ikeda.*

The genus *Spiroctetor*, Skorikow, is a synonym of *Urechis*, Seitz.

Family Bonelliidæ.

a. Male degenerate, parasitic on female.
b. Uterus single.
c. Proboscis undivided.
1. *d.* A pair of ventral hooks .... *Protobonellia.*
2. *dd.* Ventral hooks numerous, lacking a muscular sheath.................. *Acanthohamingia.*
bb. One or two uteri.
ddd. Ventral hooks absent.
3. *e.* Siphon and anal glands present .... *Hamingia.*
4. *ee.* Siphon and anal glands lacking .... *Sluiterina.*
b. Uterus single.
cc. Proboscis bifid.
5. *dddd.* Ventral hooks two or more ...... *Bonellia.*
6. *ddd.* Ventral hooks absent .... *Ikedella.*
7. *bbb.* Paired uteri. A male tube present .... *Pseudobonellia.*
8. *bbbb.* A single uterus and two small nephridia.
ccc. Proboscis cleft, without divergent arms. *Archibonellia.*

List of Papers cited.

Ikeda, I. "Note on a Deep-sea Echiuroid, *Protobonellia mitsukurii.*" Annot. Zool. Japan. vi. (4) 1908, pp. 259-265, 4 figs.

Johnston, T. H., and Tiegs, O. W. "*Pseudobonellia*, a new Echiuroid Genus from the Great Barrier Reef." Proc. Linn. Soc. N.S. Wales, xliv. (2) 1919, pp. 213–230, pls. ix. xi.

Lankester, E. Ray. "On Specimens of the Gephyrean *Hamingia arctica*, Kor. & Dan., from the Hardanger Fjord." Ann. & Mag. Nat. Hist. (5) xi. pp. 37–43.

Rietsch, M. "Étude sur les Géphyriens armés ou Echiuriens." Recueil zool. Suisse, iii. 1886, pp. 313–315, pls. xvii. xxii.

Seitz, P. "Der Bau von *Echiurus chilensis* (*Urechis*, n. g., *chilensis*)." Zool. Jahrb. Jena. Anat. xxiv. 1907, pp. 323–356, pls. xxix.–xxxi.

Sluiter, C. P. "Die Sipunculiden und Echiuriden der 'Siboga' Expedition." 'Siboga' Exped. Monogr. xxv. 1902, 53 pp., 4 pls.

Spengel, J. W. "Beiträge zur Kenntnis der Gephyreen.—IV. Revision der Gattung *Echiurus*." Zool. Jahrb. Jena. System. xxxiii. 1912, pp. 173–212, 1 pl.

Wharton, L. D. "A Description of some Philippine Thalassemæ, with a Revision of the Genus." Philippine J. Sci. Manila, viii. 1913, pp. 243–270, 2 pls.

LXXX.—*A Redescription of the Species* Oxysomatium macintoshii (*Stewart*, 1914) (*Nematoda*). By J. N. Karve, B.Sc., Zoology Department, Hislop College, Nagpur, C.P., India.

Stewart (1914), in his 'Studies in Indian Helminthology,' described a Nematode which he obtained from the rectum of *Rana tigrina* and *Bufo melanostictus* and which he named *Oxysoma macintoshii*. Although tables of measurements and some excellent drawings of the male worm are given, his description of the species is somewhat incomplete. For example, the female genitalia are not described and the presence or absence of a gubernaculum in the male is not mentioned.

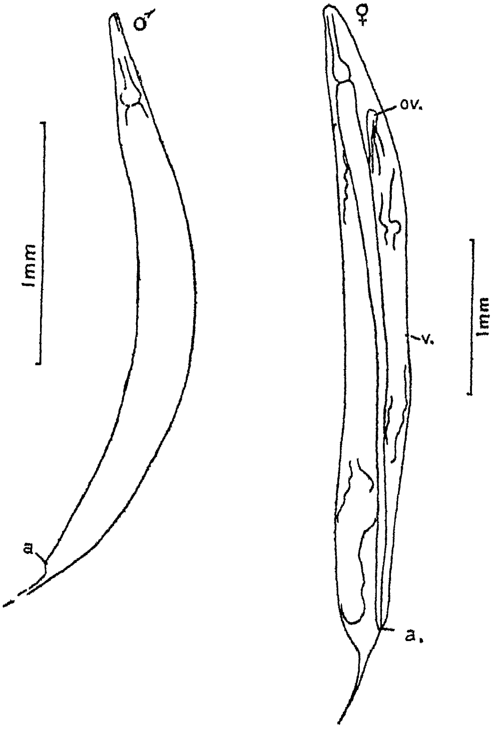
Baylis (1927), in his attempt to rearrange the species referred by Yorke and Maplestone (1926) to the genera *Oxysomatium*, Railliet & Henry, 1916 (*Oxysoma*, Schneider, 1866), and *Aplectana*, Railliet & Henry, 1916, could not determine the position of this species (*O. macintoshii*) with certainty, but referred it provisionally to the genus *Oxysomatium*. A redescription of the Nematode is therefore desirable.

I have several tubes containing worms collected from the rectum of *Rana tigrina* and *Bufo melanostictus* at different places. All these worms belong to the genus *Oxysomatium*. The collection contains some tubes from Rangoon (Burma), which Mr. K. Subramanian, of the Biology Department of the Rangoon University, very kindly sent to me. I take this opportunity of thanking him for his kindness. I am also indebted to Professor G. D. Bhalerao, of the Nagpur University, who made some helpful suggestions and allowed me to use his private literature files.

Oxysomatium [*Oxysoma*] *macintoshii* (Stewart, 1914).

This worm occurs in large numbers in the rectum of *Rana tigrina* and *Bufo melanostictus*. Every frog dissected was heavily infested with the parasite. In one animal (*Bufo melanostictus*) as many as one hundred and fifty-six worms

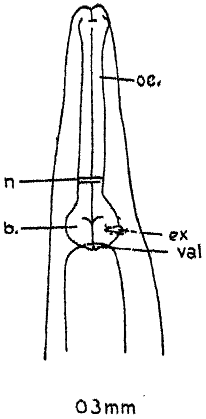
Fig. 1.



Entire male and female worms. Lateral view.
a., anus; *ov.*, loop of ovary; *v.*, vulva.

were obtained from the rectum, while only two could be found in the remaining portion of the alimentary canal; in another (*Rana tigrina*) one hundred and four were found in the rectum, while the rest of the gut was free from them.

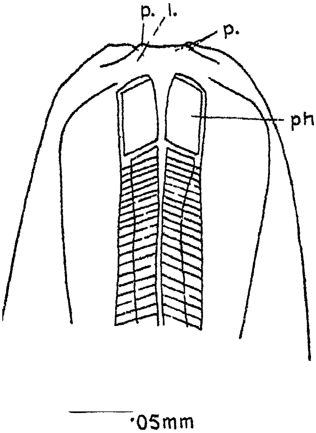
Fig. 2.



Anterior portion of the body. Ventro-lateral view.
b., œsophageal bulb; *ex.*, excretory pore; *n.*, nerve-ring; *oe.*, œsophagus; *val.*, intestinal valves.

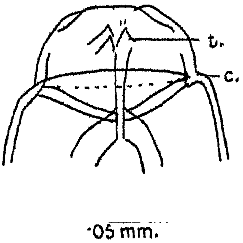
The worm has a soft, delicate, white, cylindrical body, attenuated at both ends. The cuticle is transversely striated, the striæ being very fine. The head, which can be retracted into the anterior portion of the body, is provided with three small lips—one dorsal and two subventral. On each lip are situated two papillæ. The lips, thickened at the edges, are slightly bent in towards the oral cavity. At the base of the shallow oral cavity, and situated on the anterior portion of the œsophagus, are three teeth which appear to be chitinized. The œsophagus consists of three parts: the anterior muscular portion or pharynx, the elongated tube-like portion, and the posterior bulb. The pharynx is marked off from the remaining portion of the œsophagus by a transverse diaphragm. The bulb contains the usual denticular apparatus found in Oxyurid worms. The lumen of the bulb and that of the middle portion of the œsophagus are triradiate. The bulb is followed by the intestine, the anterior part of which contains the three intestinal valves. In the majority of the worms the initial part of the intestine was wider than the bulb, but in some cases it was not so. The intestine gradually narrows down towards the anus. The excretory aperture is large and is situated in some specimens at the level of the bulb, but in others further back, even some distance posterior to the beginning of the intestine. It is rather characteristic in structure, being surrounded by what Skrjabin (1916) calls "a crown of chitinous, highly

Fig. 3.



Head, showing lips and papillæ. Dorsal view.
l., dorsal lip; *p.*, papillæ; *ph.*, pharynx.

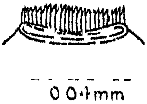
Fig. 4.



Head, showing protruded lips and teeth. Dorsal view.
c., collar; *t.*, teeth.

refractive, rod-like formations which protrude with their pointed ends outside." These rod-like structures are about 0·01 mm. in length.

Fig. 5.

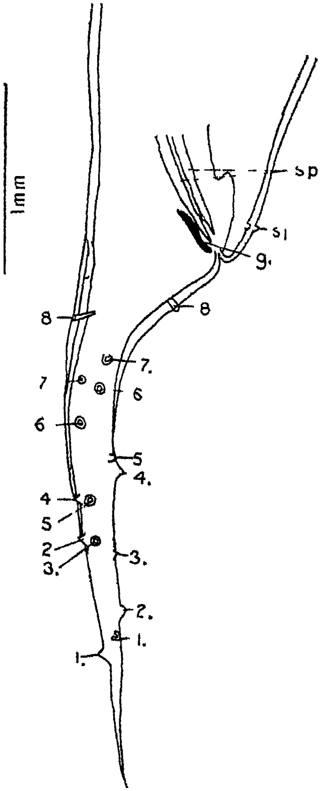


Excretory pore. Ventral view. (The rod-like formations are shown on one side only.)

Male.—Male worms are relatively infrequent. Generally, the number of males obtained from a single host is one or two. On one occasion only I obtained as many as eighteen males along with eighty-six females from a single host (*Rana tigrina*). In many cases males are altogether absent. The male is curved ventralwards at both the extremities. It measures 2–2·47 mm. in length, with a maximum thickness of about 0·262 mm. Lateral alæ are present, beginning at about 0·15 mm. from the anterior extremity and apparently ending at about 0·292 mm. from the caudal extremity. Caudal alæ are present in continuation of the lateral alæ, but they are not at all well developed. The distance from the anterior end to the posterior end of the œsophagus, including the bulb, is 0·3375–0·3525 mm. The pharynx is small and measures 0·016–0·0192 mm. The œsophageal bulb is 0·0592–0·075 mm. long and 0·067–0·0672 mm. wide. In some specimens it is wider than long, while in others the length and breadth are nearly equal. The nerve-ring and the excretory aperture are situated at 0·21–0·255 mm. and 0·3375–0·3750 mm. respectively from the anterior end. The large excretory pore opens into a sac and has a diameter of about 0·024 mm. The anus is a large aperture, semilunar in shape, with moderately-developed lips. The protective membrane of the anus which Stewart mentions could not be observed. The three papillæ, which he figures as supporting the membrane, are present. Behind the anus the tail, measuring 0·2625–0·3 mm., narrows down at once and ends in a sharp point.

There are eighteen pairs of postanal papillæ (figs. 6 & 7). Of these eight are subdorsal and ten subventral. Of the subdorsal series, nos. 1, 2, & 4 (numbering from the posterior extremity) are nearer to the mid-dorsal line than nos. 3, 5, 6, 7, & 8. Of the subventral series nos. 2, 4, & 8 are nearer to the mid-ventral line than nos. 1, 3, 5, 6, and 7. The 17th and 18th pairs are subventral, the former (fig. 7, no. 9) situated some distance from, and the latter (fig. 7, no. 10) immediately behind, the cloaca. Three pairs of preanal papillæ (fig. 7, nos. 11, 12, 13) form, with the two postanal pairs last mentioned, a group surrounding the cloaca, the most anterior being situated near the median line. Besides

Fig. 6.

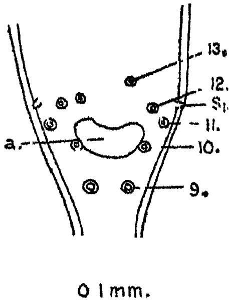


Posterior extremity of the male, to show the caudal papillæ and the accessory piece. Lateral view.

g., gubernaculum; *s.* 1, first of the six sublateral preanal pairs of papillæ mentioned in the text; *sp.*, spicules.

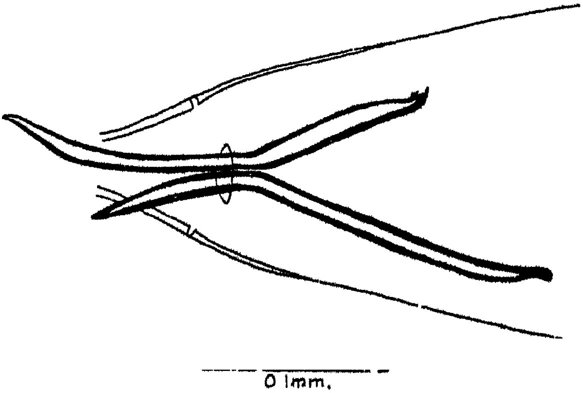
these there are six more pairs of preanal papillæ, arranged in a single sublateral row on each side of the body. Of these the first, which is near the anus, is shown in the figures (*s.* 1). The spicules are of equal size, measuring about 0·24 mm. in length. A small accessory piece, 0·0224–0·032 mm. in length, is present near the cloacal aperture.

Fig. 7.



Cloacal region of male, showing papillæ. Ventral view. *a.*, anus; *s.* 1, first of the six sublateral preanal pairs of papillæ mentioned in the text.

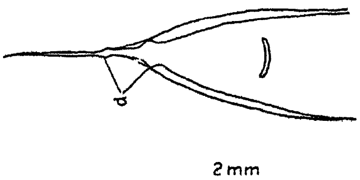
Fig. 8.



Spicules. Ventral view.

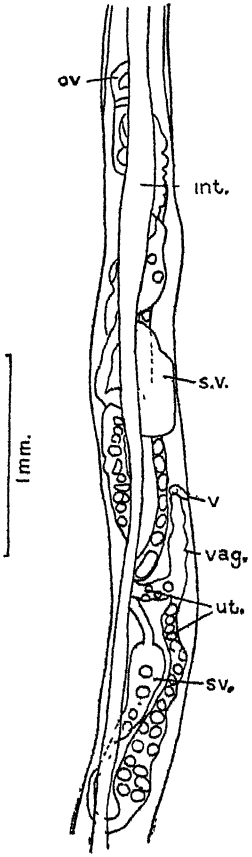
Female.—Females are found in abundance. They, like the males, are often slightly curved towards the ventral side at both the extremities, but some of the larger specimens do not show this tendency. The length is 3–6 mm., with a maximum thickness of 0·1088–0·3375 mm. The distance from the anterior extremity to the posterior end of the

Fig. 9.



Posterior extremity of the female. Ventral view.
p., caudal papillæ.

Fig. 10.



Female genitalia. Lateral view.
int., intestine; *ov.*, ovary; *s.v.*, seminal vesicle; *ut.*, uterine branches;
v., vulva; *vag.*, vagina.

œsophagus, including the bulb, is 0·427–0·5625 mm. The length of the pharynx is 0·024–0·0246 mm. The œsophageal bulb is 0·0624–0·1024 mm. in length and 0·064–0·112 mm. in width. The nerve-ring is situated at a distance of 0·21–0·375 mm. and the excretory pore at 0·2850–0·5025 mm. from the anterior extremity. The diameter of the excretory pore is about 0·014 mm. The vulva is a transverse slit with very poorly-developed lips, and is situated at about the middle of the body. In two specimens measuring 6 and 2·67 mm. it was situated at about 3·1 and 1·3 mm. respectively from the anterior extremity. The vulva leads to the vagina, which runs dorsally and a little cephalad for a distance of about 0·125 mm. It then takes a turn and runs caudad, parallel to the body-wall, for about 0·5 mm., where it divides into two uterine branches. One of these runs at right angles to the body-wall and then turns cephalad. It makes a loop and runs into the receptaculum seminis and ultimately ends in the ovary. The other uterine branch runs caudad, parallel to the body-wall and in continuation with the vagina, for a distance of about 1·30 mm. It then turns cephalad from below the intestine and runs straight, almost parallel to the body-wall, to end in an ovary like the first branch. The uterus contains eggs at different stages of development, and also larvæ. The eggs are large and irregular, and measure 0·3–0·337 mm. × 0·187–0·225 mm. The worm is viviparous and deposits on an average two larvæ every fifteen minutes in normal salt solution. The anus, like the vulva, is a transverse opening with moderately-developed lips. The tail, as in the male, rapidly narrows down behind the anus and ends in a fine point. Its length is 0·3525–0·4125 mm. There are two pairs of papillæ situated on the tail.

REFERENCES.

BAYLIS, H. A. (1927.) "On Two new Species of *Oxysomatium* (Nematoda), with some Remarks on the Genus." Ann. & Mag. Nat. Hist. ser. 9, vol. xix. pp. 279-280.

SKRJABIN, K. I. (1916.) "Parasitic Trematodes and Nematodes, etc." Scientific Results of the Zoological Expedition to Brit. E. Africa and Uganda, made by Professor V. Dogiel and I. Sokolow, in the year 1914, Petrograd, vol. i. no. 4 (Russian), pp. 1-98. (English translation), pp. 99-157, pl. i.-x.

STEWART, F. H. (1914.) "Studies in Indian Helminthology.—No. I." Records of the Indian Museum, vol. x. part iii. pp. 165-198, pls. xviii.–xxiii.

YORKE, W., & MAPLESTONE, P. A. (1926.) 'The Nematode Parasites of Vertebrates,' London.

INDEX TO VOL. XX.

ACALYPTRATA, new, 23.
Achiropsis nattereri, notes on, 528.
Acipenser persicus, notes on, 26.
Acrididæ, new, 481.
Alexander, C. P., on new or little-known Tipulidæ, 33, 353.
Allocormodes, new species of, 343.
Alysia, new species of, 588.
Amblyteles, new species of, 589.
Amblythrips, new species of, 573.
Ammodytes, new species of, 66.
Amphipoda, notes on, 63.
Andrewes, H. E., on Oriental Carabidæ, 263.
Anthobosca, new species of, 516.
Anthophora, new species of, 531.
Apionichthys dumerili, notes on, 528.
Apona, new species of, 326.
Aptinothrips, new species of, 567.
Aroa, new species of, 325.
Asterina, new species of, 273.
Azygophleps, new species of, 330.
Bæoura, new species of, 229.
Bagnall, R. S., on contributions towards a knowledge of the European Thysanoptera, 561.
Balacra, new species of, 322.
Baliothrips, new species of, 574.
Barnard, K. H., on new South African marine fishes, 66.
Bassaricyon, new subspecies of, 80.
Bathypolypus, notes on, 249.
Batrachia, new, 450.
Batrachoides, new species of, 78.
Baylis, H. A., on Nematospiroides dubius, Baylis, 1926, 102; on some new parasitic Nematodes, 214; on Turbellaria from Lake Tanganyika, 380.
Bengalia, new species of, 104.
Benthoctopus, new species of, 257.
Bethune-Baker, G. T., on new species of Heterocera, 321.
Bhalerao, G. D., on a new species of Trematode, 611.
Bibliographical Notices, 244, 317, 485.
Blair, K. G., on some Coleoptera from Polynesia, 161.
Blennius, new species of, 73.
Borodin, N., on Acipenser persicus, 26.
Borutzky, E. W., on some genera of Copepoda-Harpacticoida, 54; on the occurrence of the Amphipod Synurella ambulans in Russia, 63.
Brachevama, characters of the new genus, 553.
Braunsomeria, new species of, 545.
Brongersma, L. D., on a new lizard from Surinam, 513.
Brontispa, new species of, 105.
Bryant, G. E., on new Halticidæ from Trinidad and Porto Rico, 446.
Burton, M., on Lendenfeld's Chalininæ of the Australian seas, 289, 502.
Butterflies, new, 99.
Calicurgus, new species of, 548.
Callerebia, new species of, 100.
Callicebus, new subspecies of, 287.
Calliphora, new species of, 415.
Cantherines, new species of, 78.
Capitosaurus, new species of, 178.
Carabidæ, new, 263.
Careproctus, new species of, 76.
Carrionellus, characters of the new genus, 519.
Caucasippus, characters of the new genus, 195.
Cavia, new species of, 601.
Centropyxis, new species of, 153.
Cephalopoda, notes on, 249.
Cephalothripoides, characters of the new genus, 582.
Cephalothrips, new species of, 581.
Cercopis, new species of, 592.
Cerura, new species of, 328.
Chabanaud, P., revision du genre Heteromycteris, Kaup, 523; sur

Achiropsis nattereri, Stdr., et Apionichthys dumerili, Kaup, 528.
Chalininæ, notes on, 289, 502.
China, W. E., on genera of Membracidæ transferred to other families, 279; on Melichar's "Monographie der Cicadellinen," 281.
Chirothrips, new species of, 561.
Chorthippus, new species of, 192.
Chrysopsyche, new species of, 333.
Cis, new species of, 166.
Clinoporus, characters of the new genus, 74.
Clivina, new species of, 268.
Coccotropsis, characters of the new genus, 75.
Cockerell, T. D. A., on Hymenoptera and a Caddis larva from the Miocene of Colorado, 429; on bees from the Malay Peninsula, 530; on fossil insects in the British Museum, 585.
Cœlioxys, new species of, 540.
Coleoptera, new, 161, 585.
Colias, new species of, 99.
Conepatus, new subspecies of, 203.
Copepoda, notes on, 54.
Corythion, new species of, 153.
Cottunculoides, characters of the new genus, 76.
Creaga, new species of, 325.
Crustacea, notes on, 1, 54, 63, 113.
Cryptosalius, new species of, 550.
Cucullanus, new species of, 223.
Curran, C. H., on new Syrphidæ from Uganda, 350.
Delphacidæ, new, 296.
Delphacodes, new species of, 87.
Dendrothripiella, new species of, 568.
Dendrothrips, new species of, 568.
Dianthidium, new species of, 532.
Dicranomyia, new species of, 225, 231, 238.
Dineura, new species of, 430.
Diptera, new, 23, 33, 225, 230, 236, 385; notes on, 384.
Doaneomyia, new species of, 233.
Dreata, new species of, 326.
Dyspterna, characters of the new genus, 174.
Echinoderms, new, 273.
Echiuroidea, new, 615.
Eclipophleps, characters of the new genus, 494.
Edwards, F. W., on new Indian Tipulidæ, 225; on crane-flies from the New Hebrides, 230; on Diptera Nematocera from the South Pacific, 236.
Edwards, W. N., occurrence of Koelreuteria in Tertiary rocks, 109.
Egybolis, new subspecies of, 324.
Eidolopompilus, new species of, 552.
Elachyleon, characters of the new genus, 348.
Eleotris, new species of, 70.
Encyoposis, new species of, 344.
Enithares, new species of, 436.
Eriophyes, new species of, 372.
Eriophyidæ, new, 372, 375.
Esaki, T., on a new species of Notonecta, 284.
Esben-Petersen, P., on new and little-known Neuroptera, 343.
Euchera, new species of, 327.
Eustera, new species of, 330.
Fauna of St. Andrews Bay, 1, 113.
Fejérváry, Baron G. J. de, on reptiles from Morocco, 512.
Frost, G. A., on the otoliths of the Neopterygian fishes, 298.
Fulgorids, new, 86.
Gastroplakæis, new species of, 331.
Geological Society, Proceedings of the, 318, 486, 560.
Geotiphia, new species of, 132.
Gerris, new species of, 592.
Giaura, new species of, 321.
Glenurus, new species of, 347.
Gobius, new species of, 70.
Goding, F. W., systematic notes on Jassoidea and Membracidæ, 511.
Gonomyia, new species of, 235, 239.
Gyrodus, new species of, 187.
Halticidæ, new, 446.
Harpacticoida, notes on, 54.
Helius, new species of, 234.
Helorimorpha, new species of, 558.
Hemiptera, notes on, 279, 281, 284.
Hemiteles, new species of, 560.
Heterocera, new, 321.
Heteromera, new, 161.
Heteromycteris, notes on, 523.
Heteroptera, new, 435, 590.
Hispinæ, new, 105.
Holarthrothrips, characters of the genus, 562.
Homoptera, new, 296, 592.
Hoplocampa, new species of, 432.
Hopwood, A. Tindell, on a new Carnivore from the Oligocene, Isle of Wight, 174.

Hymenoptera, new, 429, 530, 545, 553, 588.
Ikedella, characters of the new genus, 618.
Ilburnia, new species of, 87.
Insecta, fossil, 585.
Jaczewski, T., on aquatic Heteroptera of the Ethiopian region, 135.
Jassoidea, notes on, 281, 541.
Kalicephalus, new species of, 218.
Karve, J. N., on the species Oxysomatium macintoshii, 620.
Keilin, D., on the chordotonal organs of Cyclorrhaphous Diptera, 334.
Kenia, characters of the new genus, 387.
Koelreuteria, notes on, 109.
Laphrinæ, new, 205.
Leipoxais, new species of, 332.
Lejops, new species of, 351.
Leucoma, new species of, 324.
Libnotes, new species of, 233.
Limnobia, new species of, 226.
Limothrips, new species of, 565.
Locket, G. H., on the mating habits of some Theridiid spiders, 91.
Loxerebia, new species of, 101.
Lycodonus, new species of, 74.
M'Intosh, Prof., notes from the Gatty Marine Laboratory, St. Andrews, 1; on the marine fauna of St. Andrews, 113.
Macropostrongylus, new species of, 215.
Malayia, new species of, 416.
Mallocampa, new species of, 332.
Malloch, J. R., on the species of the genus Stenomicra, 23; on exotic Muscaridæ, 385.
Mammals, new, 80, 199, 213, 287, 288, 594.
Marmosa, new species of, 607.
Massee, A. M., on new species of gall-mites from Sudan, 372; on the gall-mites of Sussex, 375.
Maulik, S., on new Hispinæ from Fiji and New Britain, 105.
Megachile, new species of, 534.
Membracidæ, notes on, 279, 541.
Micronecta, new species of, 443.
Miocoris, characters of the new genus, 591.
Molophilus, new species of, 33, 228, 353.
Monda, new species of, 325.
Monro, C. C. A., on the families and genera of the class Echinoidea, 615.
Muir, F., on some Fulgorids from the South Pacific, 86; on a new species of Sparnia, Stål, from South Chile, 296.
Muscaridæ, new, 385.
Myrmeleon, new species of, 345.
Mysidacea, notes on, 313.
Nautili, notes on, 424.
Nematocera, new, 236.
Nematoda, new, 214; notes on, 102, 620.
Neobythites, new species of, 75.
Neotheroscopus, characters of the new subgenus, 559.
Neuroptera, new, 313.
Neuroxena, new species of, 329.
Neusticurus, new species of, 543.
Notonecta, new species of, 284.
Nusa, new species of, 208.
Ochromusca, characters of the new genus, 385.
Opadothripidæ, new, 562.
Oreoptygonotus, characters of the new genus, 499.
Orgilus, new species of, 557.
Orthocladius, new species of, 243.
Orthoptera, new, 192, 481, 490, 593.
Oxythrips, new species of, 570.
Pachypasa, new species of, 331.
Palpina, characters of the new genus, 423.
Palunolepis, characters of the new genus, 68.
Panthera, new subspecies of, 213.
Paracallionymus, characters of the new genus, 67.
Parahynnodus, characters of the new genus, 69.
Paramelisa, new species of, 321.
Parevania, new species of, 554.
Parker, H. W., on parallel evolution in some Opisthoglyphous snakes, 81; a revision of some genera of frogs, 450; on the Cæcilian genera Uræotyphlus and Geotrypetes, 478.
Parkerophis, new species of, 85.
Pezomachus, new species of, 538.
Phasicnecus, new species of, 327.
Philotherma, new species of, 332.
Phlœothrips, new species of, 582.
Phyllophaga, new species of, 587.
Physalæmus, new species of, 403.

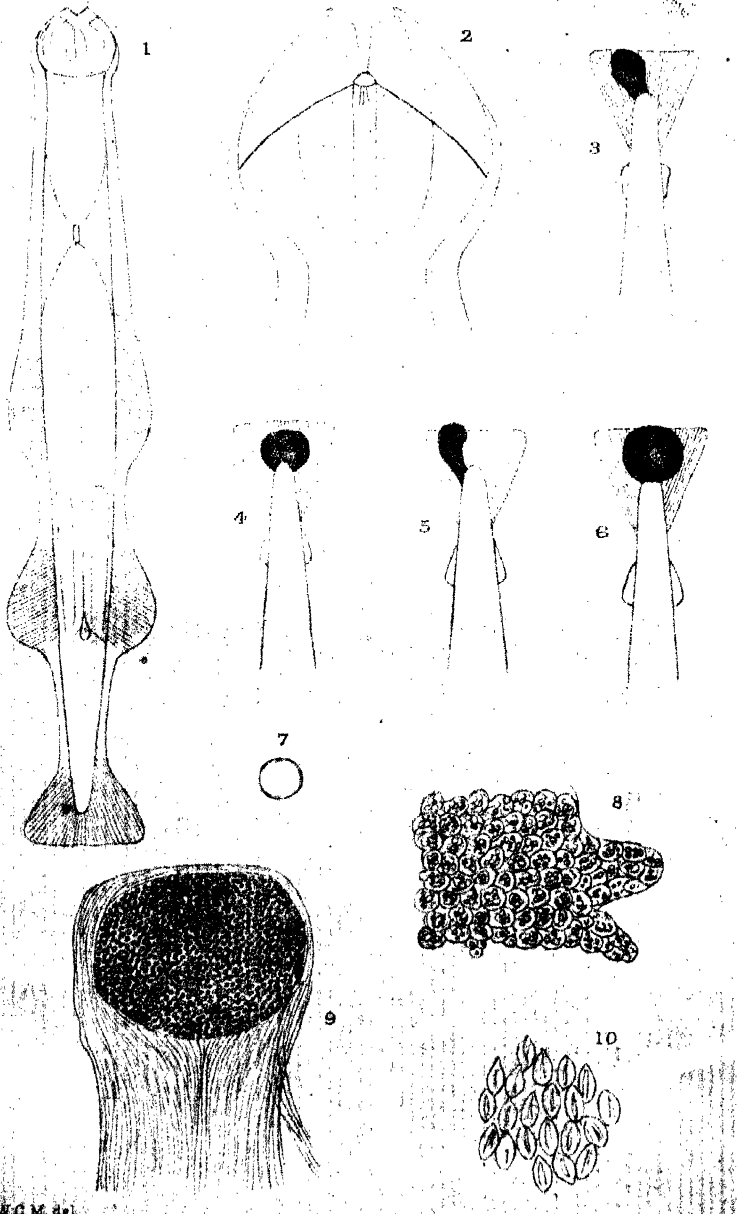
Pisces, new, 66; otoliths of, 298.
Pitthea, new species of, 329.
Plagiostomum, new species of, 380.
Platycephalus, new species of, 77.
Pleurodema, new species of, 468.
Pleuroscopus, characters of the new genus, 67.
Plutofœnus, new species of, 556.
Pocock, R. I., on two subspecies of Leopards, 213.
Podisma, new species of, 483.
Pœcilimon, new species of, 198.
Pogonosoma, new species of, 211.
Polygrodus, characters of the new genus, 191.
Promecotheca, new species of, 107.
Prosopothrips, new species of, 570.
Protanthidium, new species of, 532.
Protospirura, new species of, 220.
Psednos, characters of the new genus, 76.
Pselaphanca, characters of the new genus, 165.
Psephus, new species of, 172.
Pseudoepitrix, new species of, 446.
Pseudopaludicola, new species of, 455.
Psilus, new species of, 267.
Ptilophyllum, characters of the new genus, 309.
Ptygonotus, characters of the new genus, 497.
Rana temporaria, note on, 609.
Reptilia, new, 81, 512, 543; notes on, 28.
Rhamphopteryx, new species of, 328.
Rhamphothrips, new species of, 572.
Rhipidomyx, new species of, 600.
Rhizopoda, new, 153.
Rhysodes, characters of the new genus, 311.
Ricardo, G., on the two genera Nusa and Pogonosoma, 205.
Robson, G. C., on the North Atlantic species of Bathypolypus and Benthoctopus, 249.
Saliunca, new species of, 333.
Sambon, L. W., on a new species of Trombicula, 157.
Sapindaceæ, notes on, 109.
Scalmicauda, new species of, 328.
Semisuturia, new species of, 422.
Simpson, G. G., on the Cynodont reptile Tribolodon frerensis, Seeley, 28.
Simulium, new species of, 242.
Sluiterina, characters of the new genus, 618.
Smith, G. A., on some Echinoderms from China, 273.
Smith, S., on the Silurian coral Tryplasma rugosum, 305; structure and development of Stauria favosa, 337.
——, and Tremberth, R., on Ptilophyllum and Rhysodes, gen. nov., 309.
Sparnia, new species of, 296.
Spath, L. F., on the classification of the Tertiary Nautili, 424.
Spermophagus, new species of, 173.
Spilosmylus, new species of, 349.
Spirocerca, new species of, 221.
Stauria favosa, notes on, 337.
Stenomicra, new species of, 25.
Swezeyia, new species of, 89.
Swinton, W. E., on a new species of Capitosaurus, 177.
Synurella ambulans, notes on, 63.
Syrphidæ, new, 350.
Tarbinsky, S. P., on some new and little-known Orthoptera from Palæarctic Asia, 490.
Tattersall, W. M., on a small collection of Mysidacea, 313.
Tenebrionites, new species of, 586.
Tenthredella, new species of, 430.
Teragera, new species of, 330.
Thalpomena, new subspecies of, 198.
Theridiidæ, notes on, 91.
Thomas, O., on a new subspecies of Bassaricyon, 80; on mammals from Neuquen and the Rio Colorado, 199; on monkeys of the Callicebus torquatus group, 287; on Bornean specimens of the toledu, 288; on mammals from Peru, 591.
Thomasomys, new species of, 602.
Thrips, new species of, 575.
Thrypticomyia, new species of, 238.
Thysanoptera, new, 561.
Tipula, new species of, 229.
Tipulidæ, new, 33, 225, 230, 353.
Toosa, new species of, 334.
Treherniella, new species of, 578.
Trematodes, new, 611.
Tremberth, R., *see* Smith, S.
Trentepohlia, new species of, 227, 285.

Tribolodon frerensis, notes on, 28.
Trigona, new species of, 541.
Trilophus, characters of the new genus, 263.
Trombicula, new species of, 157.
Tryplasma rugosum, notes on, 305.
Tryxalis, new species of, 593.
Tuerta, new species of, 323.
Turbellaria, new, 380.
Turner, R. E, notes on fossorial Hymenoptera, 545; on new parasitic Hymenoptera, 553.
Uromastix, new var. of, 514.
Uvarov, B. P., on some new Caucasian Orthoptera, 192; on Podisma kingdoni, sp. n., 481.
Vanua, new species of, 90.
Verticia, characters of the new genus, 388.
Wailes, G. H., on Rhizopoda and Heliozoa from British Columbia, 153.
Watkins, H. T. G., on new Himalo-Chinese butterflies, 99.
White, E. I., on new Cretaceous Pycnodonts from the south of England, 186; on a fossil from Cyprinodont from Ecuador, 519.
White-Thomson, C. R., on an abnormal specimen of Rana temporaria, 609.
Xylota, new species of, 350.

END OF THE TWENTIETH VOLUME

PRINTED BY TAYLOR AND FRANCIS,
RED LION COURT, FLEET STREET.

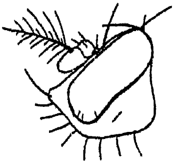
M'INTOSH, *Ann. & Mag. Nat. Hist. S. 9, Vol. XX, Pl. I.*



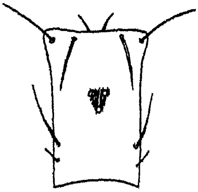
W.C.M. del.

Figs. 1, 2. South African *Sagitta*. 3-8. Caudal parasite of *S. bipunctata*. 9-10. Parasitic mass in *Hermadion*.

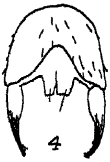
MALLOCH Ann. & Mag. Nat. Hist. S 9 Vol. XX Pl II

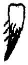


1

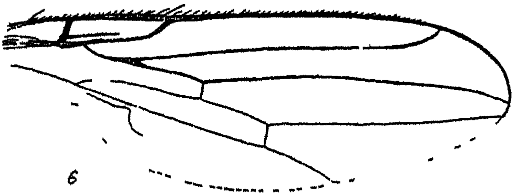


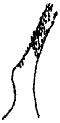
2



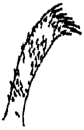


8

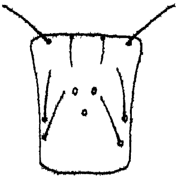




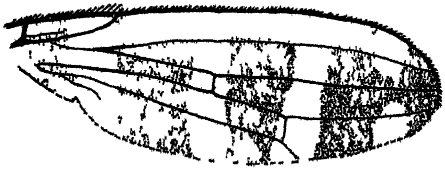
5



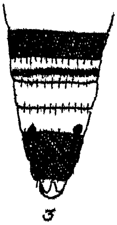
9



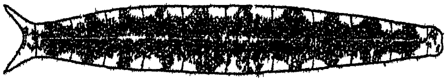
11



10

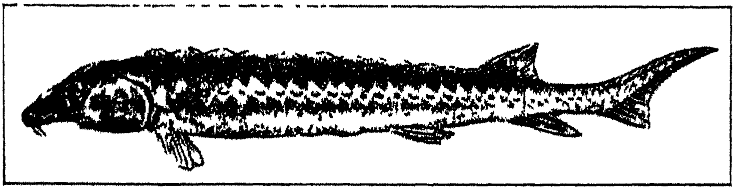


3



7

TWO NEW SPECIES OF STENOMICRA (DIPT)



Acipenser persicus, sp. n.

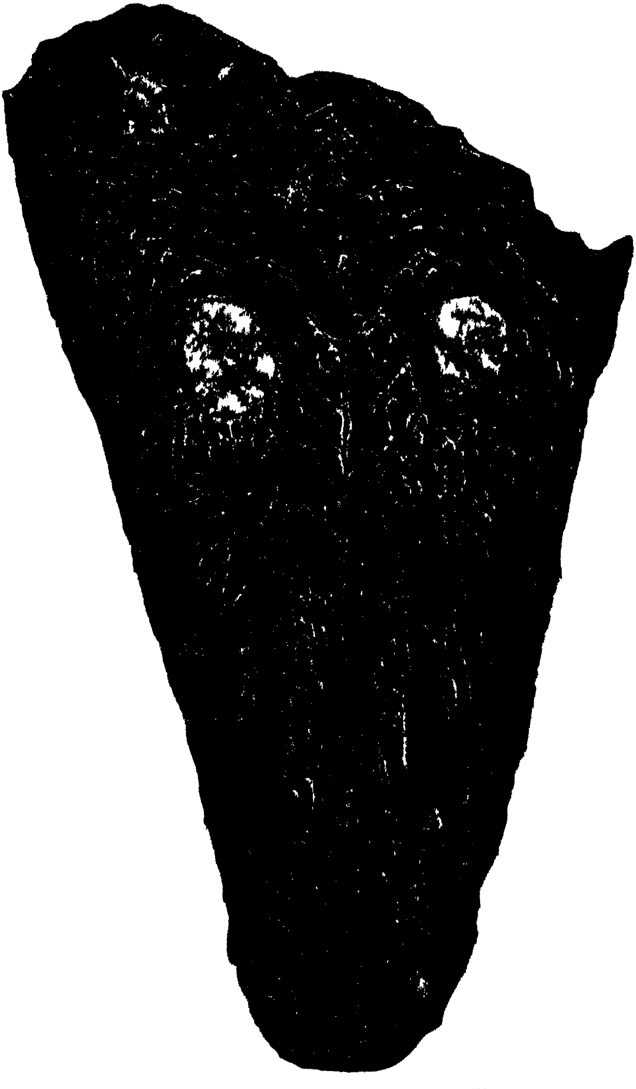
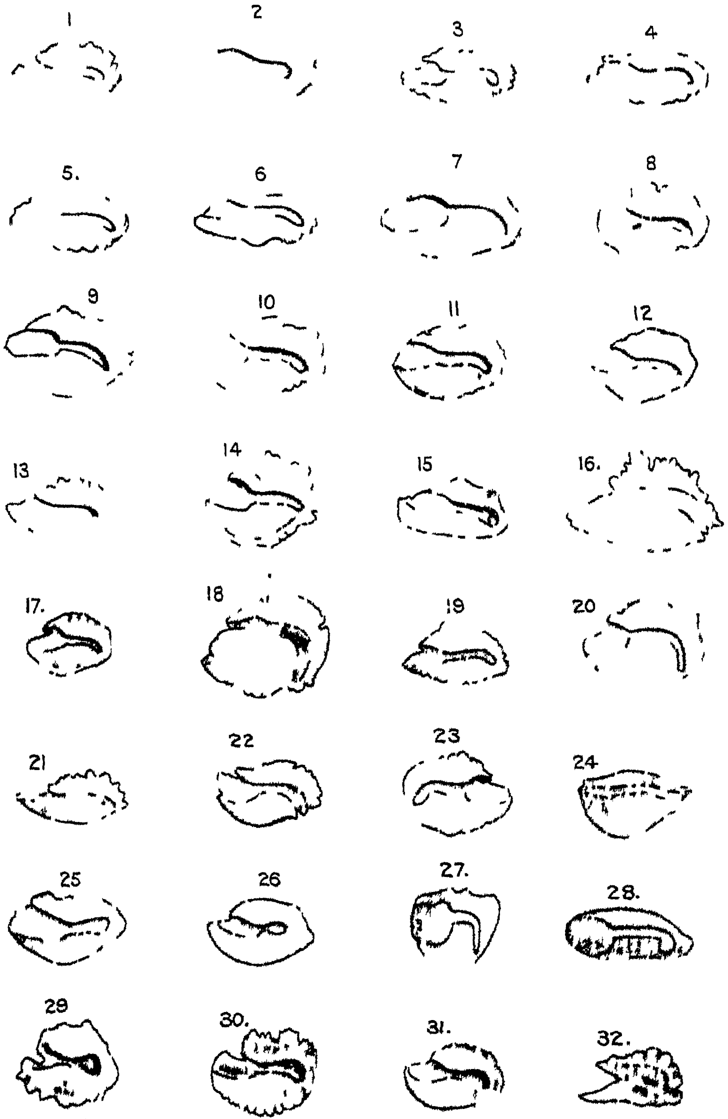


Photo H G Herring.

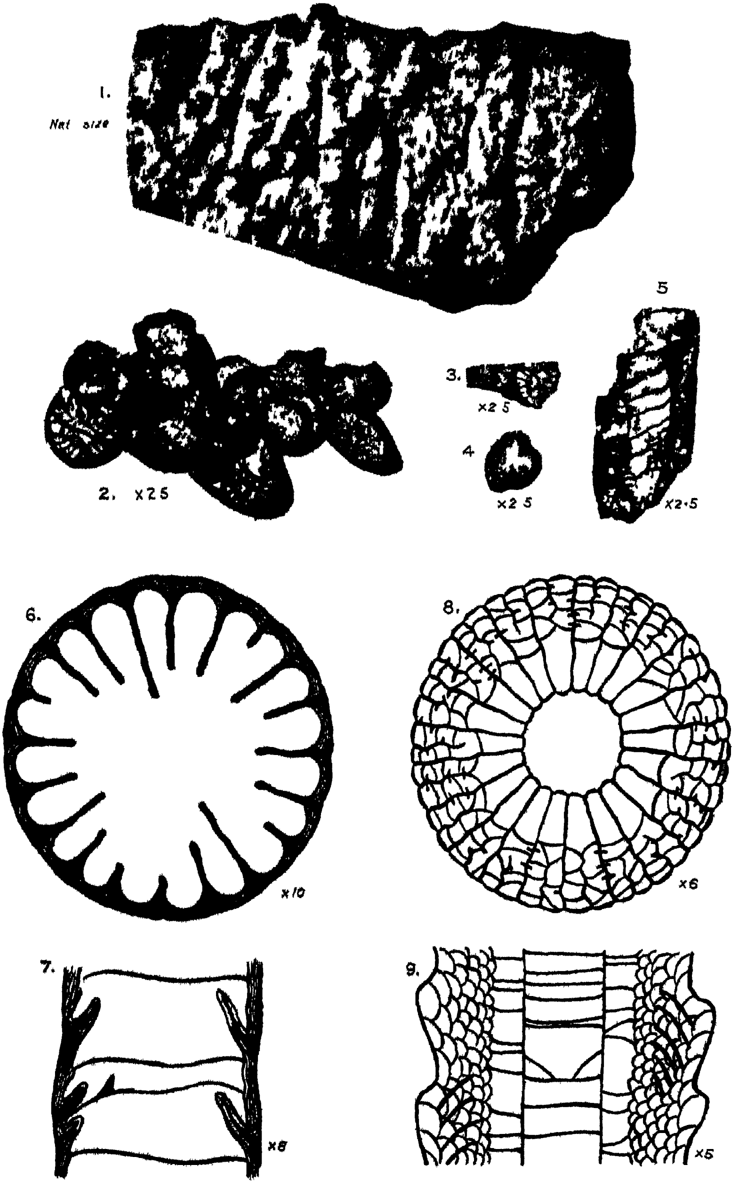
Capitosaurus semiclausus, sp n.



G Allan Frost del

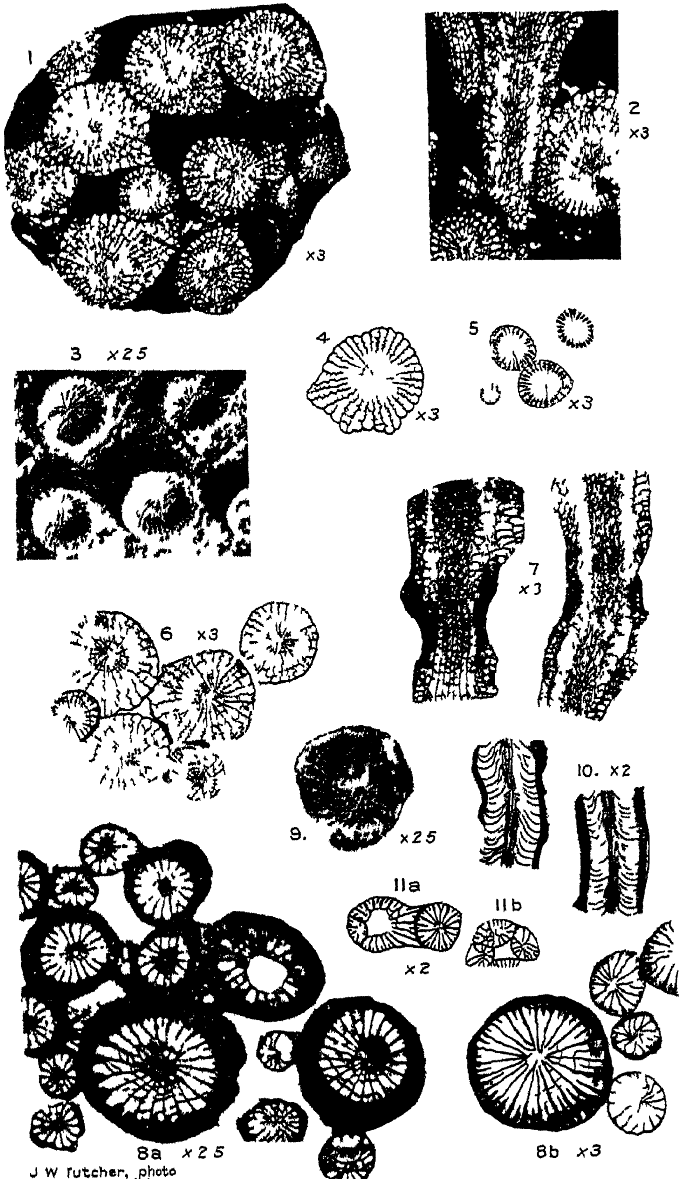
OTOLITHS OF THE DIV PERCIFORMES

I



J W. Tutcher, photo.
W. D. Lang, del

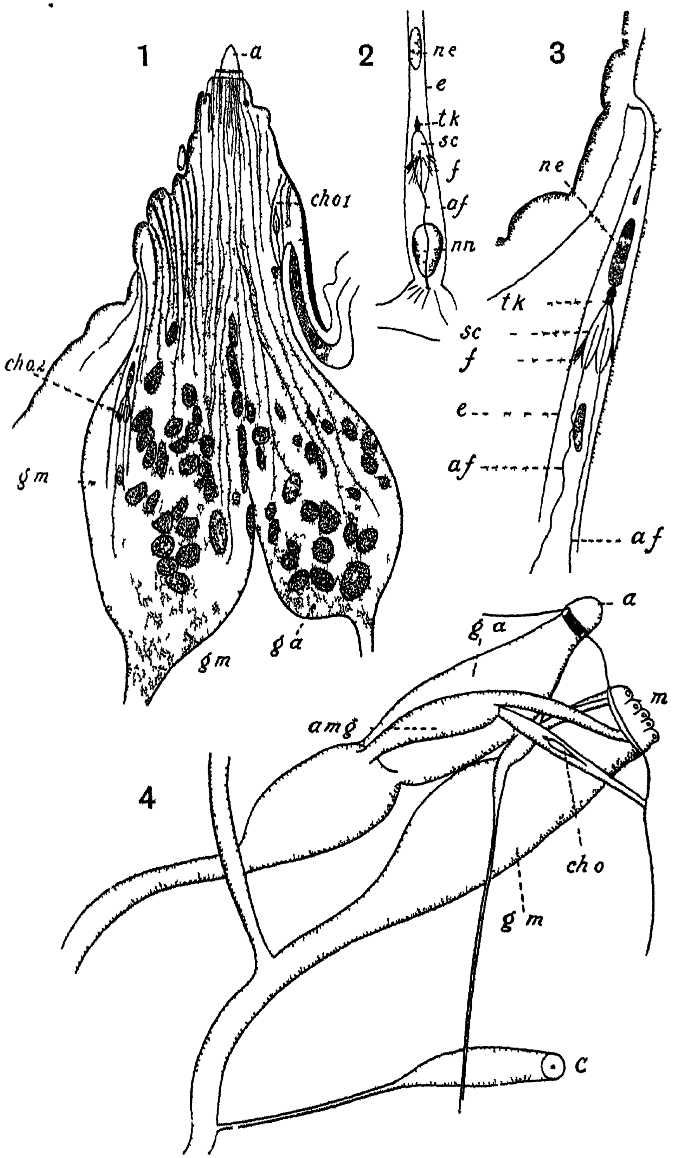
TRYPLASMA RUGOSUM (Edwards & Haime) and
ERIDOPHYLLUM SERIALE Edwards & Haime



J W Tutcher, photo
R Tremberth, del

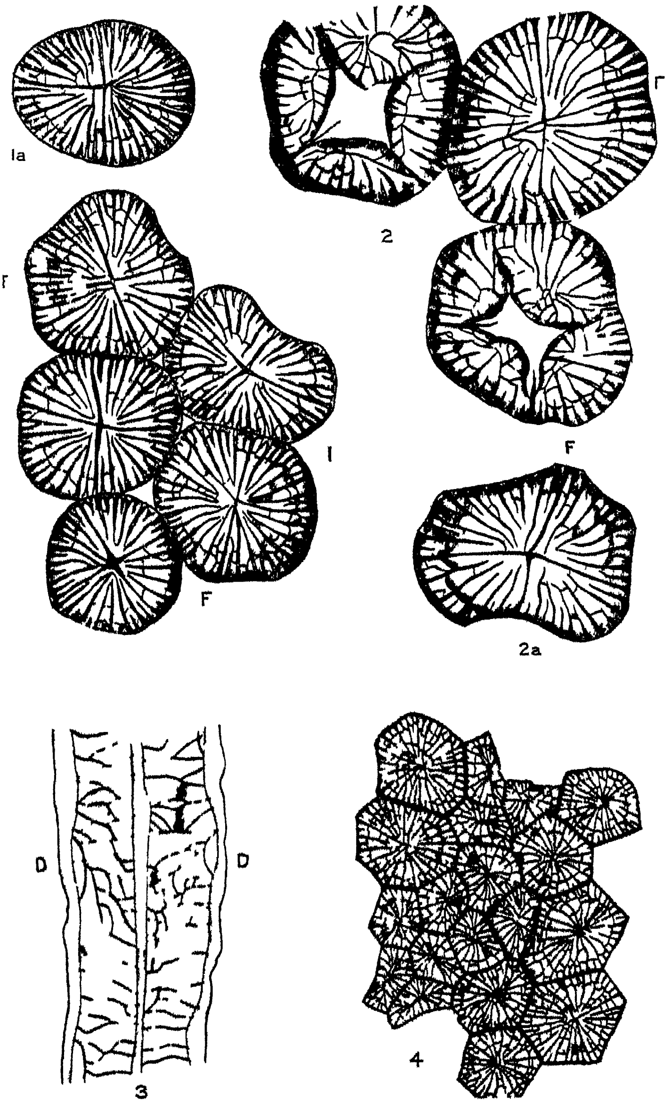
PTILOPHYLLUM LINDSTROMI sp nov and
RHYSODES SAMSUGNENSIS sp nov

KEILIN *Ann. & Mag. Nat. Hist. S. 9. Vol. XX. Pl. VIII*



H C G and D K del

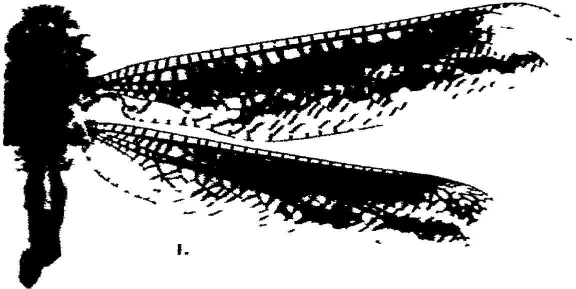
Chordotonal Organs of Cyclorrhaphous Diptera



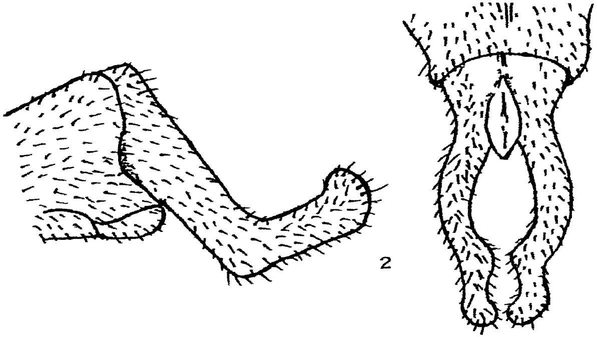
STAURIA FAVOSA (Linnæus)

ESBEN PETERSEN

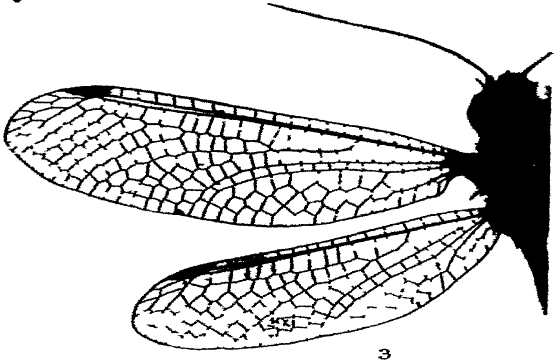
Ann. & Mag. Nat. Hist. S. 9. Vol. XX. Pl. X.



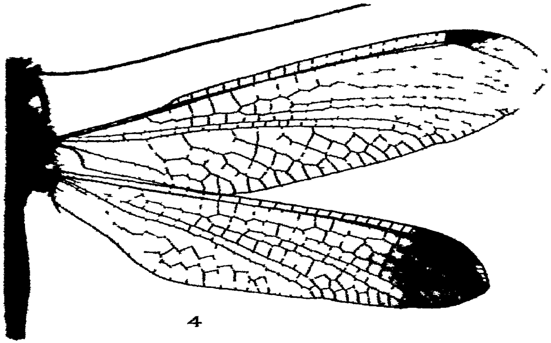
1.



2



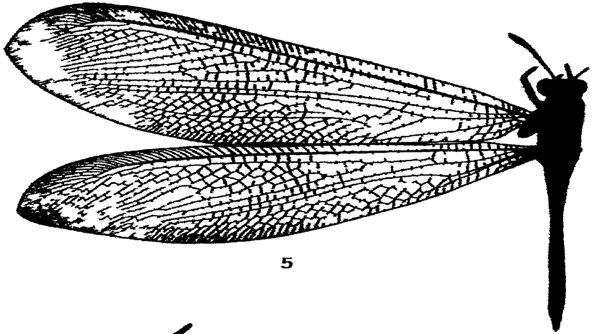
3



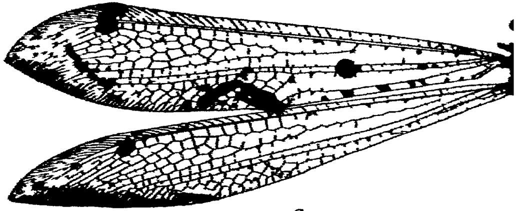
4

1 ALLOCORMODES WOODI, sp n, ♀ 2 & 3 ENCYOPSIS LLOYDI, sp n, ♂

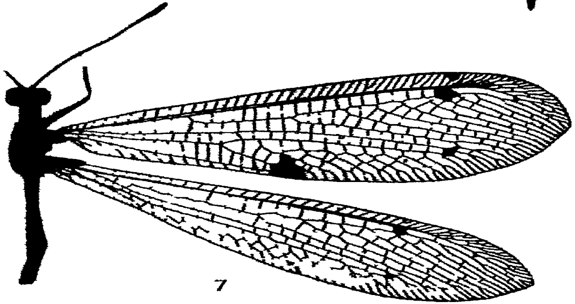
4 AMEROPTERUS DELICATULUS, Mc Lachl., ♂.



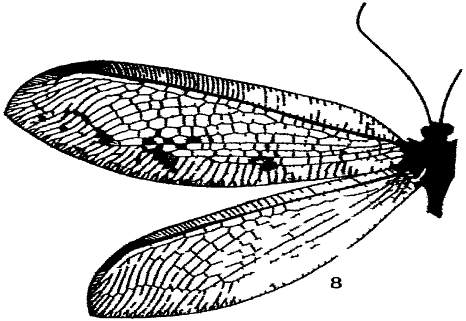
5



6



7



8

5 MYRMELEON NIGRINUS, sp n

6 GLENURUS WITHYCOMBEI, sp n

7 ELACHYLEON PUNCTIPENNIS, gen et sp n

8 SPILOSMYLUS CEYLONIENSIS, sp n

I. A. R. I. 75.

IMPERIAL AGRICULTURAL RESEARCH
INSTITUTE LIBRARY
NEW DELHI.

Date of issue	Date of issue.	Date of issue.
1. 12. 47		
14. 10. 47		
7 JUN 1955		
18. 2. 60		
19. 1. 66		
16. 2. 66		
19. 4. 66		
4. 2. 6		
26/3/71		